Definium™ 8000
X-Ray System

Operator Manual

5137442-1EN

Rev. 10 (27 February 2008)

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Medical Device Directive

This product complies with the following requirements:

Council Directive 93/42/EEC concerning medical devices when it bears the following CE marking of conformity:

The location of the CE mark label on the equipment is in the service system manual.

European registered place of business:

GE Medical Systems Europe
Quality Assurance Manager
BP 34
F 78533 BUC CEDEX

Green QSD 1990 Standard issued by MDD (Medical Devices Directorate, Department of Health, UK).

Medical Device Good Manufacturing Practice Manual issued by the FDA (Food and Drug Administration, Department of Health, USA).

Underwriters' Laboratories, Inc. (UL), an independent testing laboratory.

Canadian Standards Association (CSA).

International Electrotechnical Commission (IEC), international standards organization, when applicable.

GE Medical Systems reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation.

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Revision History

Rev #	Date	Pages Affected	Change
1	07 Nov. 2005	All	Initial release.
2	11 May 2006	All	Updates to descriptions and procedures to match new or improved hardware and software functions: • Safety and Regulatory updates • System Overview - removed mouse action functions that do not apply • System Overview - added patient name on OTS control screen • System Overview - added description Wall stand foot control, Grid/accessories holder, and Chiller • Worklist - updated status options and descriptions • Worklist - updated procedure to use auto-positioning • Image Acquisition - updated how APR codes are entered into the system • Image Viewer - updated DEI description, instances when DEI will not appear • Image Viewer - updated description of Manual Shutter • Image Management - added PACS and TG18 description to Image Tools button function • General Information - added caution not to shut down system if the tube fan is on • Quality Assurance and Maintenance - updated entire QAP process • Preferences - updated description of Auto Delete • Preferences - updated Image Processing process • Preferences - added how to add APR codes to the protocol database • Advanced Applications and Options, Dual Energy - updated descriptions • Advanced Applications and Options, Image Pasting- added floor plugs and warning, updated procedure for Legs alternate work flow • Advanced Applications and Options, Auto Positioning - added auto positioning from the wall stand hand control, added that custom positions may be added • Advanced Applications and Options, Orthopedic Magnification- updated descriptions and procedures • Glossary - removed • Specifications List - added • Contact Information - added Grammatical and typographical corrections.

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Rev #	Date	Pages Affected	Change
3	04 May 2007	2-1	Changed “GE Medical Systems” to “GE Healthcare”
		2-2	Removed Caution statement regarding the Acquisition Console. Unit no longer has an acquisition console.
		2-15	Table 2-8, Jedi Generator row. Added that the Jedi generator is located inside the system cabinet.
		3-1	Added cross-reference to Chiller section at end of “topics covered” list.
		3-4 -> 3-5	Table 3-2 Row 1. Added emergency stop button instructions. How to engage and disengage. Row 4. Corrected description of Tube Overheat indicator.
		3-7	Added section about “High Throughput Mode”.
		3-10	Updated Figure 3-7.
		3-13	Table 3-4, item 17. Updated image.
		3-14	Updated Figure 3-8 to reflect change to icons on the OTS instead of text.
		3-14 -> 3-15	Table 3-5 Tube Angle row. Updated image. Column Rotation row. Updated image. FOV row. Added image.
		3-16	Changed “the Exposure Hold icon will appear on the OTS” to “the Exposure Hold icon may appear on the OTS”.
		3-25	Added IMPORTANT notice: The wall stand is not a weight-bearing device.
		3-27->3-29	Added new section on 4-cell Ion Chamber Option.
		3-32	Table 3-8 Row 1. Corrected name and description. The LED shows exposure inhibit. Row 3. Corrected number of pre-defined positions from 4 to 3.
		3-33	Added that foot pedals now must be “double-tapped” to activate.
		3-38->3-39	Added term “double-tap” to table movement instructions.
		3-44	Table 3-10, Row 5. Added optional cross-table grid and description of how it is used for wall stand receptors in the horizontal position.
		4-1, 4-7	Changed “Many default techniques are AEC based in order to optimize image processing” to “Many default techniques are AEC based.”
		4-4, 4-6, 4-9	Added cross-reference to 4-cell Ion Chamber wall stands.
		5-3	Updated Figure 5-1 to remove SPS Location column.
		5-4->5-5	Table 5-1 Search row. Added image Patient List Area row. Added image.
		6-1	Added cross-reference to VolumeRAD appendix.

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Rev #	Date	Pages Affected	Change
3	04 May 2007 (continued)	6-2	Updated Figure 6-1.
		6-8 -> 6-9	Table 6-1 mAs row. Corrected available selection list. Warm Tube row. Added note to indicate that the warm tube function is not available from the Acquisition Screen and to remove the patient from the room before warming the tube.
		6-17	Corrected NOTE regarding the average time it takes for an image to appear on the Image Viewer screen.
		6-18	Added cross-reference to 4-cell Ion Chamber wall stands.
		7-1	Added cross-reference to VolumeRAD appendix.
		7-8	Table 7-3, Invert row. Added that the invert function is a viewer display tools only and is not DICOM supported for push to PACS or printers.
		7-9	Updated Figure 7-8 to show palette with VolumeRAD options.
		7-12	Table 7-4. Added rows for VolumeRAD functions (Apply to Slices and Quality Control Tags) with cross-references to the VolumeRAD appendix.
		7-15	Added notes that VolumeRAD image annotations and shutter adjustment are different.
		7-18	Added note that VolumeRAD re-processing is different.
		7-23	Added VolumeRAD to the list of images that will not display DEI.
		8-6->8-13	Added that images may be loaded from or copied to either a CD or DVD disk.
		8-11	Added IMPORTANT notice that CD/DVD-RW disks cannot be used to copy exams.
		9-2	Added that system shut down and start up should be performed weekly as part of QAP.
		9-3, 9-7	Reworded CAUTION from "Do not to turn the system off if the tube fan is on." to "Do not to turn the system off if the tube fan is running. Wait for the tube to cool and for the fan to stop."
		9-7	Removed that a system reset should be performed before QAP.
		9-8	Added note to indicate that the warm tube function is not available from the Acquisition Screen and to remove the patient from the room before warming the tube.
		11-1->11-13	Revised entire QAP process section and updated screen captures to reflect current system configuration and reflect that most text on buttons have been replaced with icons.
		12-2	Added cross-reference to VolumeRAD section at the end of the "topics covered" list.
		12-18	Added that when Auto Tag is set to ON, all images in the series are tagged by default.
		12-21	Table 12-7, added row for VolumeRAD auto print editing.

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Rev #	Date	Pages Affected	Change
3	04 May 2007 (continued)	12-41	Added note that WW and WC may need to be re-adjusted in order to see the described effect.
		12-54	Added section for VolumeRAD preferences with a cross-reference to the VolumeRAD appendix.
		13-13-> 13-16	Updated and added figures to show new OTS screens with icons.
		A-1->A-37	Added new appendix for VolumeRAD option.
		C-3	Changed “bucky” to “wall stand.”
		all	Miscellaneous typographical, grammatical, and formatting corrections throughout.
4	15 August 2007	2-15	Table 2-8: RCIM row - removed from table. Acquisition Workstation row - added “(X-ray Control)” to Component column, added HHS to Plate Type column.
5	1 October 2007	3-20	Added collimator heat warning.
6	25 October 2007	3-36	Table 3-9, Hand Grips row: Added picture of patient hand grips and cross-reference to installation and adjustment section. Table 3-9: Added row for abdominal compression band (and clamp).
		3-42, 3-43	Added section for installation and adjustment of abdominal compression band and patient hand grips.
7	31 October 2007	None	No changes. Revision number increased to reconcile revision number across all languages.
8	31 October 2007	None	No changes. Revision number increased to reconcile revision number across all languages.
9	31 October 2007	2-6	Changed OTS column warning from “Potential Pinch Point” to “Hand Crush Hazard”. Added keyboard use warning. Added collimator laser light warning.
		2-7	Added caution for wall stand lateral positioning bar.
		2-9	Table 2-1, added icons and descriptions for “Hand crush hazard” , “Follow operating instructions” , and “No standing on unit” .
		2-14	Table 2-7, added icon and description for laser radiation.
		2-18	Added section for pollution control label.
		3-13	Table 3-4, row 18, changed description of control to match hardware label.
		3-21	Changed laser radiation warning to match hardware label.
		3-31	Changed lateral positioning bar warning to caution and wording to match hardware label.
		3-50	Added warning not to step or stand on the chiller.
10	27 February 2008	None	No changes. Revision number increased to reconcile revision number across all languages.

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Table of Contents

Chapter 1: About This Guide

Safety Information 1-1
Graphic Conventions and Legends 1-2
Safety Notices. 1-3

Chapter 2: Safety and Regulatory

Indications for Use 2-1
Safety. 2-1
Know the Equipment 2-3
Equipment Classifications 2-3
Electromagnetic Immunity 2-3
Radiation Safety. 2-3
Emergency Procedures 2-4
Safe Operation Precautions 2-4
General Use Warnings 2-4
Patient Positioning Warnings 2-7
Tabletop Motion Warnings 2-8
Symbols 2-9
Special Notices 2-9
X-ray Tube 2-10
Power ON and OFF. 2-11
Electrical Type 2-11
Electrical Current 2-12
Ground. 2-13
Collimator 2-14
Identification and Compliance Plates 2-15
Identification Plate. 2-15
NRTL Listed Label 2-15
Identification and Compliance Plate Locations 2-16
Regulatory Requirements 2-16
Disposal of Waste 2-17
Pollution Control Label 2-18
Dose Chart. 2-19
X-ray Source Assembly Filtration 2-20

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Chapter 3: Hardware Overview

Acquisition Workstation 3-2
Mouse Controls 3-3
Radiology Console Interface Module (RCIM) 3-4
Hand-switch 3-6
Bar Code Scanner 3-8
Monitors 3-8
Overhead Tube Suspension 3-9
OTS User Interface 3-9
OTS Control Screen 3-14
System Interlocks 3-16
Grid Interlock 3-16
Automatic Exposure Control (AEC) Interlock 3-16
OTS Position Interlock 3-16
Tube Pivot Interlock 3-16
Overhead Stationary Rail and Lateral Bridge 3-17
Telescopic Column and Carriage 3-17
Longitudinal and Lateral Detents 3-17
Axes Indicators 3-18
Vertical Detent 3-18
Column Rotation 3-19
Tube Angulation 3-19
Multi-Leaf Collimator 3-20
Collimator Field and Linear Laser Lights 3-21
Automatic or Manual Collimator Modes 3-22
Multi-leaf Collimator Display 3-22
OTS Collimator Exposure Inhibit Conditions 3-23
Locking Lever 3-23
Rotating the Multi-leaf Collimator 3-23
Digital Wall Stand 3-25
Tilting the Digital Wall Stand Detector 3-27
4-cell Ion Chamber Option 3-28
Lateral Positioning Bar 3-31
Tube Stand Controls 3-32
Operator Override Switch 3-32
In Position Feedback 3-32
Tube Warm-up Misalignment 3-32

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Vertical Drive Manual Override 3-32
Handheld Control 3-33
Foot Control 3-34
Digital Table 3-35
Use the Emergency Stop Button 3-38
Raise and Lower the Digital Table 3-39
Position the Table Longitudinally and Transversely 3-40
Adjust the Overhead Tube Suspension (OTS) Position 3-41
Install or Adjust Compression Band and Hand Grips 3-42
Adjust the Tube Position 3-44
Rotate the Multi-Leaf Collimator 3-45
Image Pasting Patient Positioner 3-46
System Cabinet 3-47
Grids 3-48
Grid and Accessories Holder 3-49
X-ray Exposure Lamp 3-49
Chiller 3-50

Chapter 4: Automatic Exposure Control (AEC)

Console Screens 4-1
Ion Chamber Detectors 4-4
Applications for Detector Sensing Areas 4-4
Areas 1 and 3 4-5
Area 2 4-5
Applications 4-5
AEC Limitation Messages 4-7
Acquire AEC Images 4-8

Chapter 5: Worklist

Overview 5-2
Patient List Columns 5-7
Manage List / Find Procedures 5-8
Search 5-8
Sort by Column 5-9
Filter List 5-10
Refresh 5-13
Select Procedures 5-15

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Select a Single Procedure 5-15
Select Multiple Procedures 5-15
Delete Procedures 5-15
Delete a Single Procedure 5-16
Delete All Completed, Discontinued, and Local Procedures 5-16
Delete Suspended Procedures 5-17
Add Patient / Edit Patient Information 5-17
Overview 5-17
Add Patient 5-21
Edit Patient Information 5-22

Chapter 6: Image Acquisition

Overview 6-1
Patient Dose Reporting 6-10
Re-start Completed or Discontinued Exams 6-11
Resume Suspended Exams 6-12
Select or Change Protocols 6-12
Automatic Protocol Recognition (APR) 6-14
Conduct a Table Exam 6-15
Conduct a Wall Stand Exam 6-17
Conduct a Cassette Exam 6-20
Conduct an Emergency Exam 6-21
End Exam 6-22
Suspend 6-22
Close 6-23
Discontinue 6-23

Chapter 7: Image Viewer

Overview 7-2
Tools and Controls 7-5
Select Images 7-5
Change Viewing Format and Size 7-6
Adjust Images 7-7
Annotate and Mask Images 7-9
Customize System Annotations 7-12
Add Image Annotations 7-13
Delete Image Annotations 7-15

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Adjust Image Shutter (Crop Image) 7-16
Re-process Images 7-18
Determine Image Overexposure or Underexposure (DEI) 7-20
DEI Not Displayed. 7-22
Corrective Actions 7-22
Change Mouse Controls 7-23
Apply Quality Check Mark. 7-24
Print Images 7-24
Auto Print 7-24
Manual Print. 7-24
Send Images 7-29
Save Changes to Images 7-29

Chapter 8: Image Management

Overview. 8-1
View Patient Information 8-5
Select Image Database Source. 8-5
Load Images from a Network Host 8-6
Load Images from a CD or DVD. 8-6
Search List 8-7
Sort by Column 8-7
Open Exams and Images 8-8
Copy Exams and Images. 8-9
Copy Exams to a Network Host. 8-9
Copy Images to Another Exam 8-10
Copy Exams to a CD or DVD 8-11
Delete Exams, Series, or Images. 8-13
Lock Exams from Deletion. 8-13
Make Patient Anonymous (De-Identify) 8-14

Chapter 9: General Information

System Start Up and Shut Down 9-2
Start Up 9-2
Shutdown 9-2
Login and Log Off 9-4
Standard Login 9-4
Invalid Password Message 9-5

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Emergency Login 9-5
Inactivity Timeout. 9-6
Log Off 9-6
System Reset. 9-6
Tube Warm Up 9-7
Lead Markers 9-9
System Status and Messages 9-9
Expose Hold 9-9
X-ray Tube Heat Units Remaining. 9-10
System Status Area 9-10
Message Log 9-11
Audio Indicators 9-12
iLinq 9-12

Chapter 10: Quick Step Guides

Hardware 10-1
Hand-switch 10-1
Emergency Stop button 10-2
Raise and Lower the Digital Table. 10-2
Position the Table Longitudinally and Transversely 10-3
Adjust the Overhead Tube Suspension (OTS) Position 10-3
Adjust the Tube Position. 10-4
Rotate the Multi-Leaf Collimator 10-5
General Acquisition. 10-5
Manual Patient Entry 10-7
Add Patient. 10-7
Edit Patient Information 10-7
Advanced Applications and Options 10-7
Image Pasting Acquisition. 10-7
Initiate Auto Positioning 10-9
Login Administration 10-11

Chapter 11: Quality Assurance and Maintenance

Quality Assurance Process 11-1
When to Perform QAP 11-2
Phantoms. 11-2
Acquisition Screen Overview 11-3

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Perform QAP 11-5
Failed QAP. 11-11
Result History. 11-13
Maintenance 11-14
Periodic Maintenance 11-14
X-ray Generator Specifications 11-14
X-ray Tube Ratings. 11-14
Qualified Service. 11-14
Cleaning and Disinfecting 11-15

Chapter 12: Set Preferences

System. 12-3
Network Connections 12-3
Printers 12-8
Worklist. 12-13
Default Query 12-13
Preset Names 12-15
Image Management. 12-17
Copy Exam 12-18
Auto Tag (Quality Check) 12-18
Auto Print 12-18
Auto Send (Auto Push). 12-23
Auto Delete. 12-24
Image Viewer 12-26
Pre-set Annotations. 12-27
DEI (Detector Exposure Indicator). 12-29
Change the DEI Display 12-30
Change the Lower and Upper Limits 12-31
Enable or Disable Technical Mode 12-31
Export the DEI Log 12-31
Exam 12-32
Image Processing 12-32
Change Default Factory Looks for Exams 12-33
Build Custom Looks. 12-34
Tissue Equalization Overview. 12-38
Protocols. 12-42
Backup Protocol Database to CD 12-42

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Retrieve Protocol Database from CD 12-43
Edit Protocol Database 12-44
Protocol Editor Copy Functions 12-52
VolumeRAD 12-55

Chapter 13: Advanced Applications and Options

Dual Energy 13-2
Overview 13-2
Acquisition and Images 13-3
General Guidelines 13-3
Technique Settings and Image Quality for Chest Exams 13-3
Technique Settings and Image Quality for Abdominal Exams 13-5
Dual Energy Image Processing Preferences 13-6
Image Pasting 13-7
Overview 13-7
Image Pasting Patient Positioner 13-8
Image Pasting Acquisition 13-10
Alternate Image Pasting Acquisition Workflows 13-16
Image Viewer 13-18
Image Pasting Preferences 13-25
Auto Positioning 13-28
Overview 13-28
Initiate Auto Positioning 13-30
Auto Positioning Preferences 13-34
Orthopedic Magnification 13-36
Overview 13-36
Print Images 13-36
Orthopedic Magnification Preferences 13-38

Appendix A: VolumeRAD™

Overview A-2
Reconstruction A-2
Configurations A-4
Safety Warnings A-6
Equipment A-6
Room Layout A-6
OTS User Interface A-7

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Image Acquisition A-8
Protocol Selection A-8
Acquisition Chart A-9
Scout Acquisition A-15
VolumeRAD Sweep Acquisition A-18
Image Viewer A-20
Adjust Images A-20
View Slices A-21
Reprocess Images (Adjust Slices) A-21
Annotate Slices A-23
Print Slices A-26
Image Management A-26
Preferences A-26
Protocol Editor (Scout) A-26
Reconstruction Preferences A-29
Dose Preferences A-32
Auto Printing Preferences A-34
Workflow A-36

Appendix B: Login Administration

Enabling EA3 Login B-2
Understanding Local and Enterprise Environments B-2
Understanding Privileges, Groups, and Users B-2
Administering Groups and Users B-4
Accessing the Login Administration Screens B-4
Working with Groups B-5
Working with Users B-8
Viewing the Audit Log B-12
Administering System Configuration B-13
Change Display Settings and Enable Enterprise Authorization B-13
Configure Enterprise Authorization B-15
Configure Audit Log B-16
Use LDAP Console B-17

Appendix C: Digital Detector Overview

Theory Overview C-1
Detector Size C-1

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Number of Pixels C-1
Glass-Panel Substrate C-2
Amorphous Silicon Components C-2
Scintillation Material C-2
Connect to Electronics C-2
Detector in Wall Stand or Table C-3
Digital Image Creation C-3
Large Panel Size C-3
Wide Dynamic Range C-4
Fewer Retakes C-4
No Darkroom Needed C-4
Electronic Storage C-5

Appendix D: Specifications List

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Chapter 1
About This Guide

This chapter explains the purpose and design of this Learning and Reference Guide. It is an introduction to the guide, providing information on the purpose, prerequisite skills, guide organization, chapter format, and graphic conventions that identify the visual symbols used throughout the guide.

Topics covered include:

- *Safety Information* (p. 1-1)
- *Graphic Conventions and Legends* (p. 1-2)
- *Safety Notices* (p. 1-3)

Safety Information

Please refer to *Chapter 2: Safety and Regulatory* in this Learning and Reference Guide. The Safety chapter describes the safety information you and the physicians must understand thoroughly before you begin to use the system. Note that you will find additional safety information throughout your Learning and Reference Guide. If you need additional training, seek assistance from qualified GE Medical Systems or GE Healthcare personnel. The equipment is intended for use by qualified personnel only. This guide should be kept with the equipment and be readily available at all times. It is important for you to periodically review the procedures and safety precautions. It is important for you to read and understand the contents of this guide before attempting to use this product.

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Graphic Conventions and Legends

Table 1-1 describes the conventions used when working with menus, buttons, text boxes and keyboard keys.

Table 1-1 Conventions for menus, buttons, text boxes, and keyboard keys

Example	Describes
Select	• Marking an option in a group of check boxes or radial buttons • Choosing an option from a drop-down list • Activating a tab • Highlighting text • Highlighting row items
Click ENTER	Clicking a hard key on the keyboard.
Click CTRL+ALT+DELETE	Clicking a combination of keys on the keyboard. The key that should be clicked first is listed first.
Click and hold SHIFT	Clicking and holding down a hard key on the keyboard.
Click [START EXAM]	Clicking a button on a workstation screen.
In the **Matrix** text box,...	The name of text box in which you can select or type text or the name of a drop-down list from which you select an option.
Type **DICOMAE** in the...	Text you enter into a text box.
Select **Preferences > Worklist**.	The path of selecting option(s) in a tree structure.

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Safety Notices

The following safety notices are used to emphasize certain safety instructions. This guide uses the international symbol along with the danger, warning, or caution message. This section also describes the purpose of a Note.

DANGER: **Danger is used to identify conditions or actions for which a specific hazard is known to exist which will cause severe personal injury, death, or substantial property damage if the instructions are ignored.**

WARNING: **Warning is used to identify conditions or actions for which a specific hazard is known to exist which may cause severe personal injury, death, or substantial property damage if the instructions are ignored.**

CAUTION: **Caution is used to identify conditions or actions for which a potential hazard may exist which will or can cause minor personal injury or property damage if the instructions are ignored.**

NOTE: A Note provides additional information that is helpful to you. It may emphasize certain information regarding special tools or techniques, items to check before proceeding, or factors to consider about a concept or task.

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Chapter 2
Safety and Regulatory

This chapter explains the safety considerations, general equipment and patient related precautions, and the symbols used for the safe operation of your equipment. This chapter also includes information about the emergency procedures.

This chapter presents the concepts necessary to successfully operate your system safely. Topics covered include:

- *Indications for Use* (p. 2-1)
- *Safety* (p. 2-1)
- *Equipment Classifications* (p. 2-3)
- *Electromagnetic Immunity* (p. 2-3)
- *Radiation Safety* (p. 2-3)
- *Emergency Procedures* (p. 2-4)
- *Safe Operation Precautions* (p. 2-4)
- *Symbols* (p. 2-9)
- *Regulatory Requirements* (p. 2-16)
- *Dose Chart* (p. 2-19)
- *X-ray Source Assembly Filtration* (p. 2-20)

Indications for Use

The Definium 8000 is used to generate radiographic images of human anatomy. It is intended to replace radiographic film/screen systems in all general purpose diagnostic procedures. This device is not intended for mammographic applications.

Safety

The electrical wiring of the relevant rooms complies with all national and local codes, as well as the Regulations for the electrical equipment of buildings published by the Institution of Electrical Engineers. All assembly operations, extensions, re-adjustments, modifications, or repairs are carried out by GE Healthcare Technologies authorized service representatives. The equipment must be used in accordance with the instructions for use.

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WARNING: This X-Ray unit may be dangerous to patient and operator, unless safe exposure factors, operating instructions and maintenance schedules are observed.

To be used by authorized personnel only.

WARNING: Electric Shock Hazard! Do not remove covers or panels. The Acquisition Console and cabinets contain high voltage circuits for generating and controlling X-rays. Prevent possible electric shock by leaving covers or panels on the equipment. There are no operator serviceable parts or adjustments inside the cabinets. Only trained and qualified personnel should be permitted access to the internal parts of this equipment.

WARNING: Only GEMS/GEHC validated equipment can be plugged into the outlets in the control room wallbox. Current leakage requirements of non-validated equipment cannot be maintained with high confidence.

CAUTION: Do not lay any object on the cabinets that would restrict air flow from the top of the cabinet.

CAUTION: Always be alert to safety when you operate this equipment. You must be familiar enough with the equipment to recognize any malfunctions that can be a hazard. If a malfunction occurs or a safety problem is known to exist, do not use this equipment until qualified personnel correct the problem.

CAUTION: It is the User's responsibility to provide the means for audio and visual communication between the Operator and the patient.

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Know the Equipment

Read and understand all of the instructions in this Learning and Reference Guide before attempting to use the product.

Equipment Classifications

The following equipment classifications are applicable to the product:

- Equipment classification with respect to protection from electric shock: Class I
- Degree of protection from electric shock: Type B
- Degree of protection against ingress of liquids: Not classified
- Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with nitrous oxide; mode of operation: Continuous

Electromagnetic Immunity

WARNING: Power line anomalies or electrostatic discharges to the system cause a CD write failure error. A new CD should be used and the image re-written.

Radiation Safety

Always use the proper technical factors for each procedure to minimize X-ray exposure and to produce the best diagnostic results. In particular, you must be thoroughly familiar with the safety precautions before operating this system. Default system techniques are recommended for AEC acquisition especially on Dual Energy studies. Default techniques are designed to optimize the image processing parameters.

CAUTION: There should be no people other than the patient in the exam room during x-ray exposure. If circumstances require another person to enter the room while x-ray exposures are planned or possible, that person should wear a lead apron in accordance with accepted safety practices.

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Emergency Procedures

It is not always possible to determine when some components, such as the X-ray tubes, are nearing the end of their operating lives. These components could stop operating during a patient examination.

WARNING: The facility must establish procedures for handling the patient in case of the loss of radiographic imaging or other system functions during an exam.

Safe Operation Precautions

General Use Warnings

WARNING: For continued safe use of this equipment, follow the instructions contained in this Learning and Reference Guide. Study this guide carefully before using the equipment and keep it at hand for quick reference. It may be desirable for the facility to print this manual from a standard PC to have a hard copy available within the Radiology department.

WARNING: United States Federal Law restricts this device to use by or on the order of a physician.

WARNING: The table must be used only by qualified personnel and only after training in the specifics of these operations.

WARNING: - Potential Pinch Point: Use table foot pedals with care when lowering the table. Clearance is limited next to the table side cover, and a pinch point may exist for the operator.

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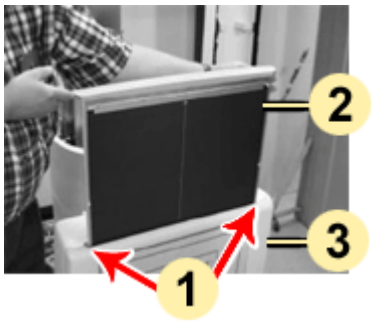
WARNING: **It is the responsibility of the operator to ensure the safety of the patient at all times. When the table is in use the patient should be monitored by visual observation, use of proper patient positioning, and use of the protective devices provided.**

WARNING: **Thoroughly check that there is no interference or possibility of collision between the patient and other equipment.**

WARNING: **Perform periodic maintenance to ensure continued safe use of the equipment. Follow recommended preventative maintenance schedule as outlined in the GE Field Service Manual.**

WARNING: **- Potential Pinch Point: When inserting the grid into the slot, a potential finger pinch hazard is created when the grid is close to the final resting position. (Figure 2-1)**

Figure 2-1 Potential pinch point



1. Potential Pinch Point
2. Grid
3. Wall Stand Detector

WARNING: **The OTS will stop motion if it comes in contact with any object. Tracking can then be enabled again by toggling the receptor selection on the user interface.**

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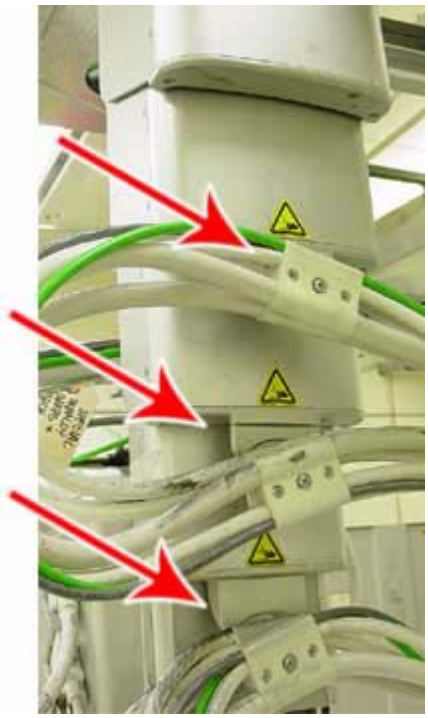
WARNING: Hand Crushing Hazard: The back of the OTS column creates pinch points (Figure 2-2) as the tube head moves up and down. Warn patients and any others in the room to stay away from the column as it is moving.

Figure 2-2 OTS column pinch points



WARNING: Some experts believe that use of any keyboard may cause serious injury to hands, wrists, arms, neck, or back.

WARNING: The collimator uses lasers to create the linear centering cross beams. Laser radiation. Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision. (Peak power 1 mw / wave length 540-700 nm / class II laser product.)

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Patient Positioning Warnings

WARNING: During patient procedures, ensure the patient's head, hands and feet are completely within the tabletop area. If any portion of the patient's body extends over the edge of the tabletop, serious injury may result.

WARNING: The maximum supported weight, with the tabletop fully extended toward the head or foot end of the table, is 220 kg (485 lb.) provided the patient is fully prostrate. Exceeding this limit may cause equipment damage or injury to the patient.

WARNING: The table is designed to remain stable under normal conditions, but when necessary for special patient loads and positioning, it will move when sufficient force is applied. If no longitudinal movement or if abnormal patient loading is required, modifications must be made to ensure the tabletop is locked longitudinally into position.

WARNING: The OTS tracks to the wall stand receptor. Use caution when moving receptor in a small room configurations. Always be sure that the patient is clear of the OTS before selecting a wall stand configuration.

WARNING: During auto positioning, watch OTS motorized movement when patient or any other person is under OTS, never leave patient unattended during positioning for examination.

WARNING: The OTS is designed to remain stable under power on conditions. When power to the system is removed, the OTS may drift up or down.

CAUTION: The wall stand lateral positioning bar is a hand rest only and is not intended to support a person's full weight. To avoid falls and potential injuries, do not hang or pull on the bar.

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Tabletop Motion Warnings

WARNING: When the power to the table is off, the tabletop can move freely. To avoid injuries, monitor the tabletop movement.

WARNING: Prior to raising or lowering the tabletop, ensure there are no obstructions present, above or below.

WARNING: Before the patient gets on or off the tabletop, always press the Table Control Lock button. This momentarily blocks the foot pedal functions and avoids injuries to the patient or damage to the equipment if a control pedal is accidentally engaged.

WARNING: To avoid injury to fingers and hand do not allow the patient's or operator's fingers to be extended over the edges of the tabletop. Hands must be kept away from table top edges at all times.

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Symbols

This section explains the symbols used on this system and in its accompanying documents.

Special Notices

Table 2-1 Special notices

Symbol	Description
	Dangerous voltage. This indicates an avoidable, dangerous, high voltage hazard.
	This symbol on the equipment indicates the operating instructions should be consulted to assure safe operation.
	Hand crushing hazard. This symbol indicates that serious injury to the hand may occur.
	Follow operating instructions. This symbol directs you to consult this manual for more information.
	No stepping or standing on unit.

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X-ray Tube

Table 2-2 describes the operational symbols for the system such as X-ray emissions and collimator locations.

Table 2-2 Operational symbols

Symbol	Description
	X-ray emission is used to indicate the X-ray tube head is emitting X-rays. Take adequate precautions to prevent the possibility of any persons carelessly, unwisely, or unknowingly exposing themselves or others to radiation.
	X-ray source assembly is used to indicate a reference to an X-ray source assembly.
	X-ray tube is used to indicate a reference to the X-ray tube, e.g., to mark the surface of a grid, which is to be oriented towards the X-ray tube.
	Identifies controls or indicators associated with normal rotational speed of the X-ray anode.
	Identifies controls or indicators associated with high rotational speed of the X-ray anode.
	Identifies controls or indicators associated with the selection of a small focal spot or the connection for the corresponding filament.
	Identifies controls or indicators associated with the selection of focal spot or the connection for the corresponding filament. When used with the small focal spot symbol, this symbol applies to the larger focal spot. When used with the large focal spot symbol, this symbol applies to the smaller focal spot.
	Identifies controls or indicators associated with the selection of a large focal spot or the connection for the corresponding filament.

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Power ON and OFF

Table 2-3 describes the power controls of the system, located on the RCIM.

Table 2-3 Power controls

Symbol	Description
	A gray SYSTEM RESET button is used to reset the system. The button is located on the RCIM.
	A green POWER ON button is used to turn on the power to the system. The button is located on the RCIM.

Electrical Type

Table 2-4 describes the electrical protection rating based on system type.

Table 2-4 Electrical type

Symbol	Description
	Type B Equipment indicates the equipment provides a particular degree of protection against electrical shock regarding leakage current and protective earthing per IEC60601-1.

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Electrical Current

Table 2-5 describes the symbols for the different types of electrical current that may be used on your system.

Table 2-5 Electrical current types

Symbol	Description
	Alternating Current indicates the equipment is suitable for alternating current only.
	Direct Current indicates the equipment is suitable for direct current only.
	Both direct and alternating currents indicate the equipment is suitable for both direct and alternating current.

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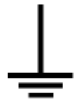
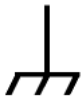
Ground

Table 2-6 describes the different types of grounding used in your system.

Table 2-6 Ground types

Symbol	Description
	Functional Earth (ground) Terminal indicates a terminal directly connected to a point of a measuring supply or control circuit or to a screening part, which is intended to be earthed for functional purposes.
	Noiseless (clean) earth (ground) identifies any terminal of a specially designed earthing system where noise from earth of leads will not cause a malfunction of the equipment.
	Protective earth (ground) identifies any terminal which is intended for connection of an external protective conductor to protect against electrical shock in case of a fault.
	Frame or chassis identify the frame or chassis terminal.
	Equipotentiality identifies terminals that bring the various parts of equipment or systems to the same potential when connected together. These terminals are not necessarily at earth (ground) potential. The value of the potential may be indicated next to the symbol.

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Collimator

Table 2-7 describes the collimator controls and the radiation field.

Table 2-7 Collimator descriptions

Symbol	Description
	Control for indicating radiation field by using light.
	Identifies controls for opening the collimator blades, or indicates partially or fully open state.
	Identifies controls for closing the collimator blades, or indicates closed state.
	Indicates the collimator blades are closed. The controlled blades are shown in thicker lines.
	Indicates the collimator blades are open. The controlled blades are shown in thicker lines.
	Indicates the use of laser radiation.

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Identification and Compliance Plates

Product identification labels can be found on the tops and sides of the cabinets, the rear of monitors, and other exterior surfaces on the equipment. The types of system identification compliance plates are located in Table 2-8.

Identification Plate

Figure 2-3 Typical identification plate

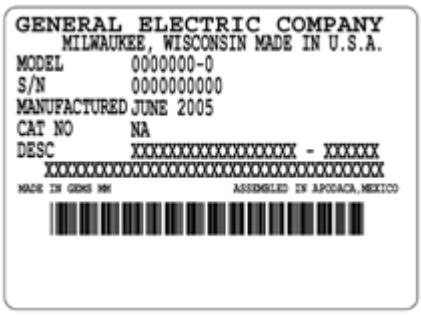
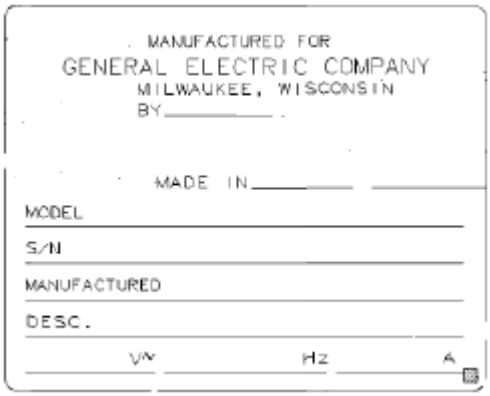


Figure 2-4 Typical identification plate



NRTL Listed Label

The Nationally Recognized Testing Laboratory (NRTL) label indicates that the assembly is listed or recognized by a nationally recognized testing laboratory (i.e. ETL, UL, CSA)

Figure 2-5 ETL Listed Label

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Identification and Compliance Plate Locations

Table 2-8 identifies the type of compliance plates and their location on your system.

Table 2-8 System identification and compliance plates

Component	Plate Type
OTS Suspension X-ray MX 100 X-ray Tube Casing	Identification, HHS, CE, NRTL
Acquisition Workstation (X-ray Control)	Identification, HHS
Table	Identification, HHS, CE,NRTL
Collimator	Identification, HHS, CE, NRTL
Wall stand	Identification, HHS, NRTL
Flat Panel Monitor	Identification, NRTL, CE
System Cabinet	Identification, NRTL
Jedi Generator (located inside the System Cabinet)	Identification, HHS, NRTL, IEC

Regulatory Requirements

NOTE: This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emission limits for Group 1 Class A Medical Devices as stated in EN 60601-1-2. However, there is no guarantee that interference will not occur in a particular installation.

NOTE: If this equipment is found to cause interference (which may be determined by switching the equipment on and off), you (or qualified service personnel) should attempt to correct the problem using one or more of the following measures:

- Reorient or relocate the affected devices.
- Increase the space separating the equipment and the affected device.
- Power the equipment from a source different from that of the affected device.
- Consult the point of purchase or the service representative for further suggestions.

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NOTE: The manufacturer is not responsible for any interference caused either by the use of interconnect cables other than those recommended or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

NOTE: To comply with the regulations applicable to an electromagnetic interface for a Group 1 Class A Medical Device, all interconnect cables to peripheral devices must be shielded and properly grounded. The use of improperly shielded and grounded cables may result in the equipment causing radio frequency interference in violation of the European Union Medical Device directive and Federal Communications Commission regulations.

NOTE: Do not use devices which intentionally transmit radio frequency (RF) signals (cellular phones, transceivers, or radio controlled products) in the vicinity of this equipment, as it may cause performance outside the published specifications.

Keep the power to these type devices turned off when near the equipment.

The medical staff in charge of this equipment is required to instruct technologists, patients, and other people who may be around this equipment, to fully comply with the above requirement.

This product complies with the following requirements:

Council Directive 93/42/EEC concerning medical devices when it bears the following CE marking of conformity:

Figure 2-6 CE mark

CE 0459

Disposal of Waste

This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

Figure 2-7 Disposal of waste symbol

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Pollution Control Label

The following product pollution control information is provided according to SJ/T11364-2006 *Marking for Control of Pollution caused by Electronic Information Products.*

Figure 2-8 Pollution control symbol

This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 *Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products*. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is Year.

In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly.

Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures.

This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.

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Dose Chart

Use Table 2-9 to compare film speed to dose values.

Table 2-9 Dose Chart

Expected Detector Default Dose (µGy)at 80 kVp is less than:	Equivalent Film Speed
16.00	100
12.90	125
10.00	160
8.00	200
6.25	250
5.00	320
4.00	400
3.20	500
2.50	640
2.00	800
1.60	1000

CAUTION: Use the largest possible focal spot-to-skin distance to keep the patient absorbed dose as small as possible.

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CAUTION: **If no technical factors are present in the system for any view, the default settings are:**

- **kV = 40**
- **ma = 25**
- **mAs = .25**
- **SID = 100cm**
- **Grid = In**

These values are placeholders only. No exposures should be made until the user selects values appropriate for the patient size.

X-ray Source Assembly Filtration

The x-ray source assembly is comprised of the x-ray tube and collimator. Together they provide permanent, non-removable filtration of 2.7 mm aluminum equivalent @ 71 kVp. Additional collimator filtration is user selectable. Refer to *Chapter 3: Hardware Overview-Multi-Leaf Collimator* (p. 3-20) for detailed information.

CAUTION: **This system is designed to be used with only the GE MX-100 tube and collimator model number 2266999. Replacement of either of these components with different types may render the system non-compliant to applicable radiation safety standards and regulations.**

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Chapter 3
Hardware Overview

This chapter explains the different hardware components of your system, such as the acquisition workstation, digital table, overhead tube suspension, digital wall stand, multi-leaf collimator, and digital detector.

Topics covered include:

- *Acquisition Workstation* (p. 3-2)
- *Overhead Tube Suspension* (p. 3-9)
- *OTS User Interface* (p. 3-9)
- *System Interlocks* (p. 3-16)
- *Overhead Stationary Rail and Lateral Bridge* (p. 3-17)
- *Telescopic Column and Carriage* (p. 3-17)
- *Longitudinal and Lateral Detents* (p. 3-17)
- *Vertical Detent* (p. 3-18)
- *Column Rotation* (p. 3-19)
- *Tube Angulation* (p. 3-19)
- *Multi-Leaf Collimator* (p. 3-20)
- *Digital Wall Stand* (p. 3-25)
- *Digital Table* (p. 3-35)
- *Image Pasting Patient Positioner* (p. 3-46)
- *System Cabinet* (p. 3-47)
- *Grids* (p. 3-48)
- *X-ray Exposure Lamp* (p. 3-49)
- *Chiller* (p. 3-50)

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Acquisition Workstation

The Acquisition Workstation (Figure 3-1) has its own dedicated computer and image data base. The Workstation applications are based on a graphical, multi-screen, mouse-driven interface. Images, lists, menus, and control panels are displayed within graphical screens on the workstation's monitor. You make your selections using buttons, menus, and control panels.

The workstation has several components:

- A computer unit with internal hard disk unit for system software and image storage, and a DVD-R/CD-RW combination drive
- Two monitors
- An alphanumeric keyboard, mouse, and pad
- Radiology Control Interface Module (RCIM)
- Console hand-switch
- Bar code scanner

The Acquisition workstation supports many functions:

- Image acquisition using the digital detector or free cassette
- Image display and manipulation
- Image transfer to other workstations using the DICOM standard
- Image transfer to a recordable CD

Figure 3-1 Acquisition Workstation

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Mouse Controls

The mouse (Figure 3-2) is a hand-operated device that you maneuver across the surface of a pad. As you do, the on-screen cursor mimics the movement of the mouse, allowing you to move among screens and between monitors. For instance, moving the mouse to the right causes the on-screen cursor to move to the right. The selections are made by clicking the left and right buttons.

The mouse pointer (or cursor) will automatically move between monitors as the far right and left edges are reached.

When typing information into a screen, the mouse pointer must be on the same monitor as the screen, or the text will not be entered. If the mouse pointer moves to the other monitor, click the mouse in the screen where you are typing.

Figure 3-2 The mouse

1. Left Button
2. Right Button

Table 3-1 Mouse actions

Mouse Action	Description
Click	Press and release the left mouse button to select an item, activate a button or icon, or set an insertion point at the cursor's location. The action performed depends on the item that is being clicked.
Right-click	Press and release the right mouse button to show available options, properties, or shortcut menus for the selected item or items. The type of options or information presented depends on the item that is being right-clicked.
Click and drag	Press and hold the left mouse button down while moving the cursor to the desired location. This is used to select multiple items, move items, or use annotation tools.

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Radiology Console Interface Module (RCIM)

The Radiology Console Interface Module (RCIM) (Figure 3-3) controls the power and reset functions for the system. The RCIM has the power on button, reset button, an emergency stop button, and indicator lights. These functions are described in Table 3-2.

The RCIM is placed at the workstation between the monitors and the keyboard.

Figure 3-3 RCIM

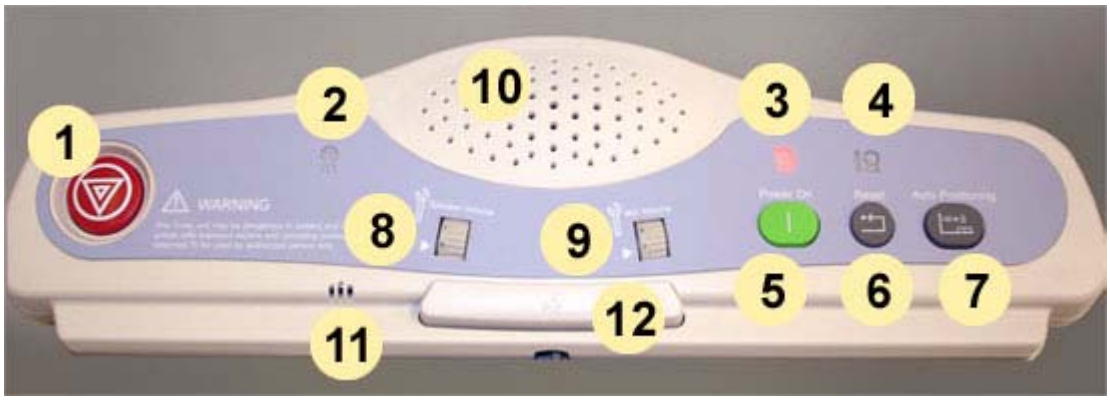

Table 3-2 RCIM controls

Control		Description
1. Emergency Stop button		Immediately Powers down the Table, OTS, and wall stand. Also stops image exposure. To engage: Press the button. To release: Turn the button clockwise (indicated by the arrows on the button) until it stops, then release.
2. X-ray Exposure indicator		Lights up when x-rays are being emitted, including tube warm up and QAP.
3. Expose Hold indicator		Lights up when there is some inhibit to taking exposures. Click the Expose Hold button on the Worklist or Acquisition screens for a list of all current inhibits.

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Control		Description
4. Tube Overheat indicator		Lights up when the tube is too hot to continue taking exposures. Allow the tube to cool until the LED turns off.
5. Power On button		Turns on the power for the entire system. Also used in combination with the AUTO POSITIONING button to activate Auto Positioning functions. Refer to *Chapter 9: General Information-System Start Up and Shut Down* (p. 9-2) for more information.
6. Reset button		Shuts down and re-starts the system for QAP or in the event of software failure. Refer to *Chapter 9: General Information-System Start Up and Shut Down* (p. 9-2) for more information.
7. Auto Positioning button		Initiates automated system positioning. Press and hold this button **and** the POWER button at the same time to begin system movement. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more information.
8. Speaker Volume control		Adjusts the volume of the speaker in CT Scan configurations. Not active in this product.
9. Mic Volume control		Adjusts the volume of the microphone in CT Scan configurations. Not active in this product

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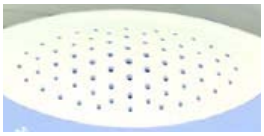
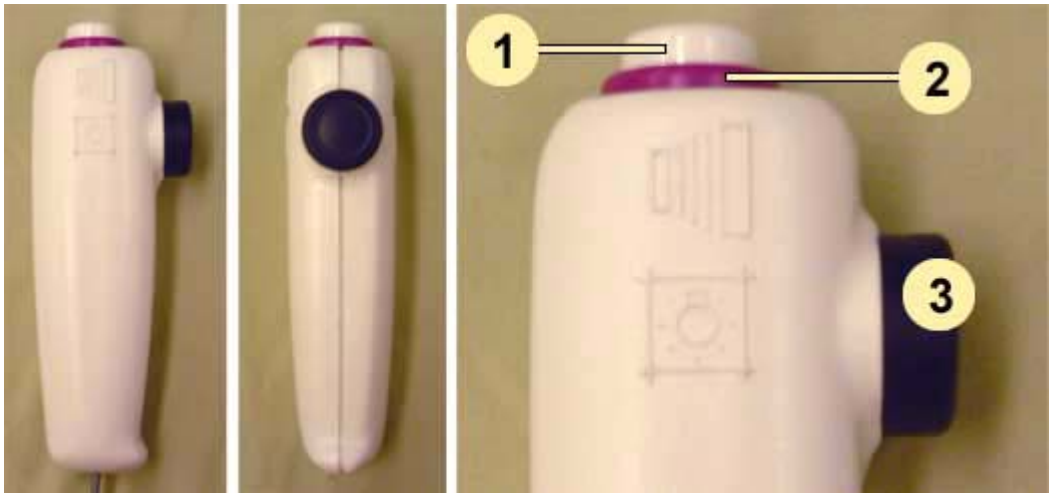
Control		Description
10. Speaker		Allows you to hear the intercom in CT scan set ups. Not active in this product.
11. Microphone		Allows you to speak through the intercom in CT scan configurations. Not active in this product.
12. Intercom talk button		Turns on the microphone to use the intercom in CT scan configurations. Not active in this product.

Hand-switch

Record exposures are made with the console Hand-switch. The Prep/Expose button on this switch has three positions: OFF, PREPARE, and EXPOSE (Figure 3-4 and Table 3-3).

Figure 3-4 Console hand-switch



1. PREPARE (target rotating)
2. EXPOSE
3. Collimator Lamp Switch (not active in this product)

Table 3-3 Hand-switch positions

Position	Description
OFF	The OFF position is when no pressure is applied to the Prep/ Expose button on top of the Hand-switch.

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Position	Description
PREPARE	PREPARE is the next position on the Hand-switch. When it is partially pressed, it brings the rotor up to speed and heats the filament. PREPARE also checks the system interlocks and verifies the system is ready to make an exposure. If you release the button, it returns to OFF.
EXPOSE	The EXPOSE position is when the button on the Hand-switch is fully depressed. This produces X-rays that are recorded. Release the Prep/Expose button after the exposure is completed.

Use this procedure to operate the console Hand-switch to prepare and record exposures.

1. Make sure your patient and the console are set up for the procedure.
2. Press the Prep/Expose button to the PREPARE position.
   - When the PREPARE function is completed, the READY message appears on screen.
3. Press the Prep/Expose button to the EXPOSE position.
   - The exposure is taken.

NOTE: A procedure must be selected prior to attempting an exposure or an error will occur.

4. Release the Prep/Expose button after the exposure is completed.

High Throughput Mode

The system will enter High Throughput Mode if Prep or Expose is activated 8 or more times within 5 minutes. When in this mode, the rotor will remain engaged for 90 seconds after the Prep or Exposure is finished. The High Throughput Mode will remain active until the Prep and Expose rate has decreased to less than 5 within 5 minutes. This mode allows rapid exposures for extended periods by reducing the amount of tube heating due to Rotor On/Off cycling. All other exposure and acquisition functions remain the same.

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Bar Code Scanner

The bar code scanner is a fast, easy way to enter data into the system. The bar code scanner allows you to aim at a printed bar code on paper and scan the information into the system. The printed bar code information comes from a RIS or HIS system through a network.

The scanner reads the bar code information and enters it into the selected text box. An audible beep sounds as the system detects and automatically enters the information. Some bar code scanners move the mouse cursor to the next text box for you. Others require you to manually move the cursor to the next text box.

Figure 3-5 Bar code scanner

CAUTION: Laser Light. Do not stare into beam, IEC class 2 laser product 630 - 680 nM, 1.0 mW Laser.

Monitors

The Acquisition workstation has two flat-panel monitors. The left monitor is the Acquisition console, where the Worklist and Acquisition screens appear. The right monitor is the Viewer, where the Image Viewer and the Image Management screens appear.

The cursor will automatically switch between monitors as the mouse is moved left and right.

NOTE: In periods of inactivity longer than 10 minutes, the monitor screen goes blank. Press a key on the keyboard or move the mouse to restore the monitor's image.

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Overhead Tube Suspension

The Overhead Tube Suspension (OTS) is the positioning device that supports the X-ray tube and OTS User Interface. The OTS has available movement on 5 axes for use in advanced applications.The suspension provides convenient movement and accurate positioning of the equipment.

New features:

- 5 axes motorized motion
- Improved column rotation
- Extended vertical travel for upright (Standing) lower extremity exams
- Precision detents (system will auto drive into detent once within range for better accuracy and improved user ease)

Figure 3-6 Overhead Tube Suspension (OTS)

The X-ray OTS consists of the following major elements:

1. Overhead stationary rail and lateral bridge

2. Telescopic column and carriage

3. X-Ray tube and housing

4. OTS User Interface

5. Multi-leaf collimator

OTS User Interface

The OTS User Interface (Figure 3-7 and Table 3-4) allows you to make receptor, FOV, collimation, kV and mAs selections without returning to the Acquisition Workstation. This interface also provides the functions to move the OTS in multiple directions.

NOTE: FOV and collimation can only be changed on the OTS User Interface.

NOTE: Changing exposure parameters or receptors on the OTS User Interface or the Acquisition Workstation will result in a change to both.

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Figure 3-7 OTS User Interface

18 - Rear view of OTS

Table 3-4 OTS User Interface functions

Item Number and Type	Name	Description
1 Indicator	Ready LED	Indicates the exposure interlocks are satisfied (green light). The indicator flashes when the key switch (#18) is in the OVERRIDE position.
2 Indicator	Image Pasting Prep LED	Indicates that the system is preparing for an Image Pasting acquisition. (not active in this product) Refer to *Chapter 13: Advanced Applications and Options* for more information.
3 Indicator	Inhibit LED / Exposure Hold	Indicates the exposure interlock is active (red light), which inhibits exposure. When the Exposure Hold is active, press the [EXPOSE HOLD] button on the OTS Control Screen to see a list of the current inhibits. Refer to *OTS Control Screen* (p. 3-14) for more information.

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Item Number and Type	Name	Description
4 Indicator	Manual Collimator LED	Indicates when the system has switched to manual collimation mode (green + yellow steady light). In this mode, the collimator field of view (FOV) is not limited to the receptor area. If the key switch is in OVERRIDE position, the manual collimation LED flashes (green + yellow blinking light).
5 Indicator	Lateral Detent LED	Indicates that the OTS is at lateral detent.
6 Indicator	SID Detent LED	Indicates that the tube is at the SID specified by the protocol.
7 Control	Longitudinal Lock Release	Releases the lock to allow longitudinal motion of the OTS. The lock is active when you release the button. The LED is lit when button is pressed. The Longitudinal lock is an electromagnetic type lock and remains activated when the power is off.
8 Control	Lateral Lock Release	Releases the lock to allow lateral motion of the OTS. The lock is active when you release the button. The LED is lit when button is pressed. The Lateral lock is an electromagnetic type lock and remains activated when the power is off.
9 Control	Detent	Activates the configured lock detent positions for all axes. The Locks activate when you position the tube in these positions. A longitudinal detent position is present when the digital wall stand is in the horizontal position.

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Item Number and Type	Name	Description
10 Control	Tube Angulation Lock Release	Releases the lock to allow tube angulation. The lock is active when you release the button. The LED is lit when the button is pressed. The Angulation lock is an electromagnetic, spring applied type. It remains on when the system power is off.
11 Control	Vertical Lock Release	Releases the lock to allow vertical motion of the OTS. The lock is active when you release the button. The LED is lit when button is pressed. The Vertical lock is an electromagnetic, spring applied, type. It remains on when the system power is off.
12 Control	Column pivot release	Releases the column lock to allow for pivot of tube arm
13 Control	All-lock Lock Release	Releases the lock to allow vertical, lateral and longitudinal motion of the OTS. The lock is active when you release the button. The All Transitional Locks Released LED (#16) is lit when button is pressed. Detents remain activated if the detent button is selected.
14 Indicator	Detent Mode Active LED	Indicates that the OTS is in detent mode.
15 Control	Collimator Field Light	Toggles the collimator field light ON or OFF. The light ON time is controlled by the system configuration.

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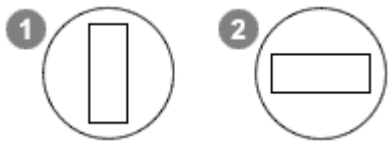
Item Number and Type	Name	Description
16 Indicator	All Transitional Locks Released LED	Indicates that all locks are released (green light).
17 Control	OTS control screen	Displays and controls exposure settings. Refer to *OTS Control Screen* (p. 3-14) for more information.
18 Control	Key Switch	Located on the back of the OTS User Interface, this key switch is intended for use when an x-ray field limitation system failure has occurred. The OVERRIDE position disables the exposure hold interlocks and allows exposure. In the digital table and digital wall stand applications, the full detector area and SID = 100cm is used when in OVERRIDE position. Engaging OVERRIDE mode shuts down certain system functions, including auto-shutters and tissue equalization. This may effect image quality. If OVERRIDE is engaged, return the switch to the NORMAL position at the end of the exam. 1) Normal Position 2) OVERRIDE Position 

NOTE: In emergencies, the tube unit can be moved against the force of the OTS locks.

WARNING: If the key switch OVERRIDE is selected, you must ensure the collimator field of view matches the receptor and the tube is aligned to the receptor. Use the collimator field light to match the X-ray field to the receptor.

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OTS Control Screen

The OTS control screen displays the SID, tube angle, and collimator rotation. The control screen allows you to change the kV, mAs, receptor, and FOV. The control screen is able to change orientation from horizontal to vertical as the OTS is rotated (Figure 3-8).

Image Pasting protocols have alternative OTS control screens. Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more information.

Figure 3-8 OTS control screen in horizontal and vertical orientation.

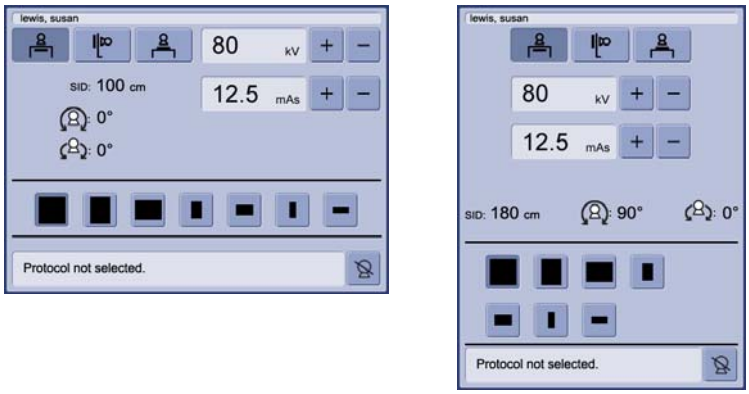

Table 3-5 OTS control screen functions

Item	Description
patient name lewis, susan	If enabled on your system, shows the patient name for the current exam. If this feature is not enabled, the field will be blank.
Receptors	Selects the receptor. The availability of the receptor depends on if it is enabled through the protocol setup on the Acquisition Workstation. If the receptor is not defined in the selected preset procedure, the receptor is not selectable from the OTS.
SID SID: 100 cm	Displays the SID value in digital table and wall stand applications. The SID display is blank if you have selected table-top mode or if tube angulation exceeds +/- 45 degrees of receptor.
Tube Angle 0°	Displays the tube angulation in degrees.

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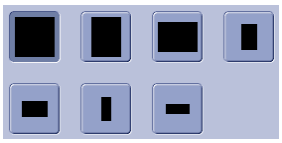
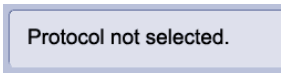
Item	Description
Column Rotation	Displays the column rotation in degrees.
kV	Increases or decreases the exposure kV. Press and release the button to adjust the value by 1 kV. Hold the button down to adjust the value by 5 kV.
mAs	Increases or decreases exposure mAs. The range is based on the focal spot selected at the Acquisition Workstation. If AEC mode is selected at the Acquisition Workstation: • This control is disabled • The display value is blank until the exposure is completed
Image Size (FOV) 	Selects the Field of View (FOV) for the exposure. Sizes are (in order from largest to smallest): • 41x41cm • 35x41cm • 41x35cm • 24x30cm • 30x24cm • 18x24cm • 24x18cm
[EXPOSURE HOLD]	Appears when there is some condition that prevents an x-ray from being taken, such as the exam room door being open or the tube is not in alignment with the detector. Press the button to view a list of all errors and interlocks that are preventing the exposure. The items are removed from the list as they are corrected. The button disappears when all errors and interlocks are corrected.
messages 	Displays the last system status message.

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System Interlocks

Your system has a series of interlocks that can place the system in an exposure hold state. When certain conditions exist outside of normal operation, the red LED on the user interface becomes lit.

Grid Interlock

If the Grid interlock is activated, the Exposure Hold icon will appear on the OTS user interface and at the Acquisition workstation screens. Select the Exposure Hold icon for detailed description on the inhibit condition.

Automatic Exposure Control (AEC) Interlock

If the tube is not centered laterally and longitudinally on the ion chamber that has been selected, the Exposure Hold icon may appear on the OTS user interface and at the Acquisition workstation screens. Select the Exposure Hold icon for detailed description on the inhibit condition.

OTS Position Interlock

When the X-ray field is outside of the detector area and/or not in lateral or SID detents, the Exposure Hold icon will appear on the OTS user interface and at the Acquisition workstation screens. Select the Exposure Hold icon for detailed description on the inhibit condition.

NOTE: This interlock is no longer active when the tube angle is > +/- 10 degrees.

Tube Pivot Interlock

The Tube Pivot interlock LED illuminates when the tube pivot must be rotated to 0 degrees (normal position).

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Overhead Stationary Rail and Lateral Bridge

The overhead rail system consists of the stationary rails (ceiling mounted) and a bridge that travels longitudinally along the rails. Guide bearings maintain alignment of the bridge with the rails and the X-ray table. The Longitudinal Lock Release button on the User Interface controls the motion of the bridge along the rails.

Telescopic Column and Carriage

The telescopic column (Figure 3-6) permits vertical travel of the X-ray tube unit. The Vertical Lock Release button on the User Interface controls the vertical motion. The vertical load is balanced by a spring counterpoise system within the carriage. The counterpoise system is equipped with a safety-locking feature to prevent the tube unit from falling in the event of spring or main cable failure. Adding an accessory, such as a collimator extension cylinder, may cause the suspension to be slightly out of balance. The carriage rides laterally within the bridge. The Lateral Lock Release button on the user interface controls the lateral motion.

CAUTION: Collimator accessory weight may not exceed 4.5 kg (10 pounds). Use special care when using such an accessory since the tube unit tends to descend when the Vertical lock is released.

Longitudinal and Lateral Detents

The suspension is equipped with Longitudinal and Lateral detents to automatically apply the locks and signal the collimator when the tube is positioned at specific SIDs (Source Image Distance), for digital table or wall stand procedures. The locks are actuated through calibrated SID detents. For the table, the lateral detent is set at the table's lateral center line. For the wall stand, the lateral detent is set at the wall stand lateral center line, and the longitudinal detent is set at SID 180cm (72 inches) and 100cm (40 inches). Selections are made at the time of installation and usually with the focal spot over the longitudinal table and the wall stand center line.

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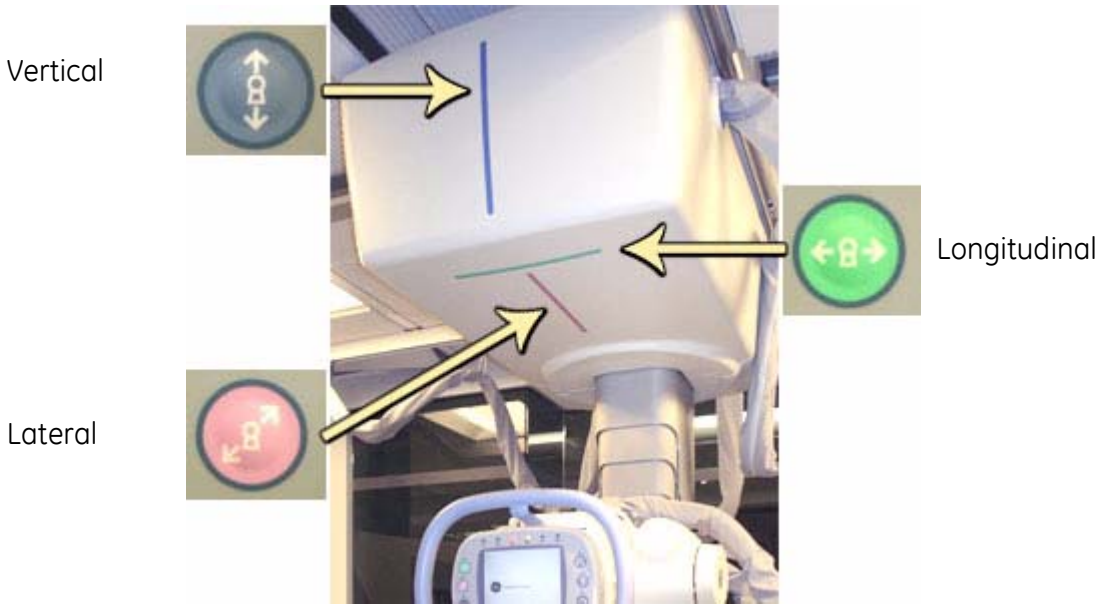
Axes Indicators

The Definium 8000 also offers color-coordinated axes indicators (Figure 3-9). These axes markers, located on the carriage, above the column, are color coded to match the release controls on the OTS user interface. The colors for the 3 axes are as follows:

- Blue - Vertical axes
- Red - Lateral axes
- Green - Longitudinal axes

Figure 3-9 Axes indicators and corresponding OTS release controls



Vertical Detent

There is a calibrated vertical detent for the OTS column that sets the locks when the X-Ray tube is at 100cm (40 inches) above the detector or film. This detent position is selectable at system installation.

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Column Rotation

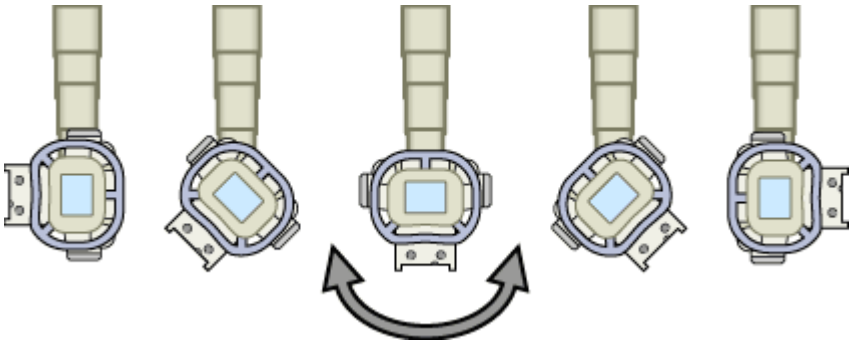
The telescopic column can be rotated +/- 137 degrees for better positioning. The degree of column rotation is indicated on the OTS user interface. Column rotation detent is set at 0 degrees.

Figure 3-10 Column rotation

Tube Angulation

The X-Ray tube and collimator can be angulated about the short axis (cranial or caudal direction). The degree of tube angulation is indicated on the OTS user interface. Tube angulation detents are located at 0 and +/-90 degrees.

Figure 3-11 X-ray tube angulation



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Multi-Leaf Collimator

The multi-leaf collimator allows you to adjust the radiation field size to the anatomy (Figure 3-12 and Table 3-6). This collimator can be used in either the manual or automatic mode. This section describes the controls and basic features of the collimator.

WARNING: Hot Surface! The housing can be heated if the light localizer is switched on for longer periods of time. Please do not touch the lamp housing until it has been cooled down in order to prevent burning.

Figure 3-12 Multi-leaf collimator controls

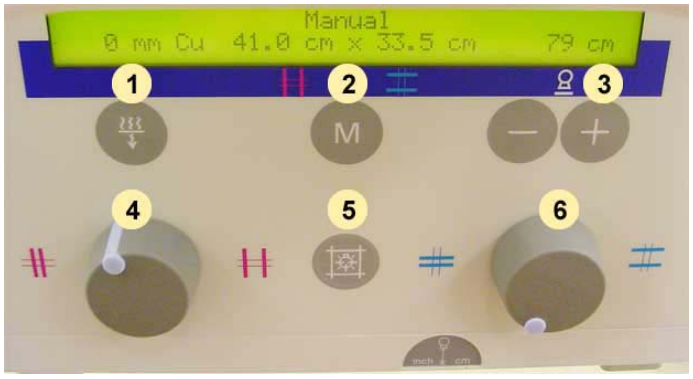

Table 3-6 Multi-leaf collimator controls

Item	Description
1. Spectral Filter Selection	Displays the spectral filter selections. The options are 0, 0.1, 0.2 and 0.3 mm of Cu. Press the button to change the filtration.
2. Message	Displays messages when Exposure Hold is active and providing information concerning the positioner interlocks that are disabling the exposure. If there is no Exposure Hold, displays the size of the collimation field (FOV).
3. SID display	Displays the current Source Image Distance. Press the [+] and [-] buttons to switch the SID between 100 and 180 cm (40 and 72 in).
4. Lateral collimator field size	Adjusts the lateral field size. Turning the dial to the left closes the collimator, turning to the right opens the collimator.

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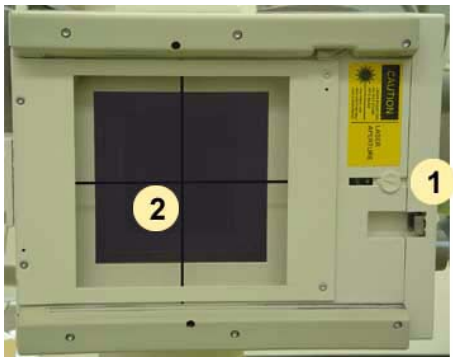
Item	Description
5. Collimator light switch	Turns the collimator light on and off. Cutout can also be performed automatically via an internal time switch. The operating time can be configured in steps of up to 90 seconds.
6. Vertical collimator field size	Adjusts the vertical field size. Turning the dial to the left closes the collimator, turning to the right opens the collimator.

Collimator Field and Linear Laser Lights

The collimator light switch toggles both the centering cross and the linear laser lights on and off (Figure 3-13). The centering cross is used to display the longitudinal and transverse axis of the exposure field on the digital detector or directly on the patient. This identifies the field that will be exposed. The linear laser light provides an axis mark, which is lined up with the centering mark on the handle of the digital detector. This allows you to verify that your collimator is centered with the detector. The laser light slider is used to open and close the aperture for the laser light, allowing you to show or hide the laser beam.

Figure 3-13 Collimator lights



1. Linear laser light aperture and slider
2. Centering cross light

WARNING: Laser radiation. Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision. (Peak power 1 mw / wave length 540-700 nm / class II laser product.)

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Automatic or Manual Collimator Modes

The automatic collimator mode allows you to select preset collimation field sizes. When in the manual mode, you have to rotate the knobs and set the field size. In the Tabletop application, the manual mode is always active.

In the Digital Table application, manual mode is active when:

- Tube Angulation is > ±10 degrees
- SID is < 90cm or >130cm
- Tube is not positioned over the table In the Digital Wall Stand application, manual mode is active when:
- Tube angulation is >100 degrees or <80 degrees with the wall Stand in the vertical position
- Tube angulation is >±10 degrees with the wall Stand in the horizontal position

Multi-leaf Collimator Display

The multi-leaf collimator has an ACSS display that provides information about the collimator. Figure 3-14 and Table 3-7 explain the information displayed on the collimator.

Figure 3-14 Multi-leaf collimator display

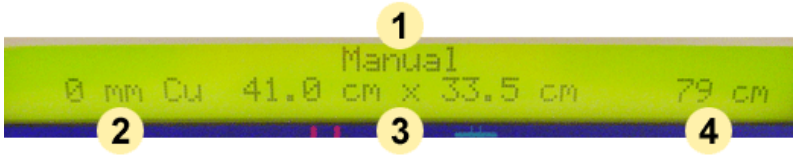

Table 3-7 Multi-leaf collimator display

Item	Description
1	X-ray Field of View (FOV) • PBL = automatic format collimation system • Manual = manual mode of collimation
2	Spectral Filter Selection display
3	Width and Height display of collimated X-ray field
4	Film-Focus Distance (SID) display

NOTE: The display of the SID and collimator FOV can be configured for either English or metric units.

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OTS Collimator Exposure Inhibit Conditions

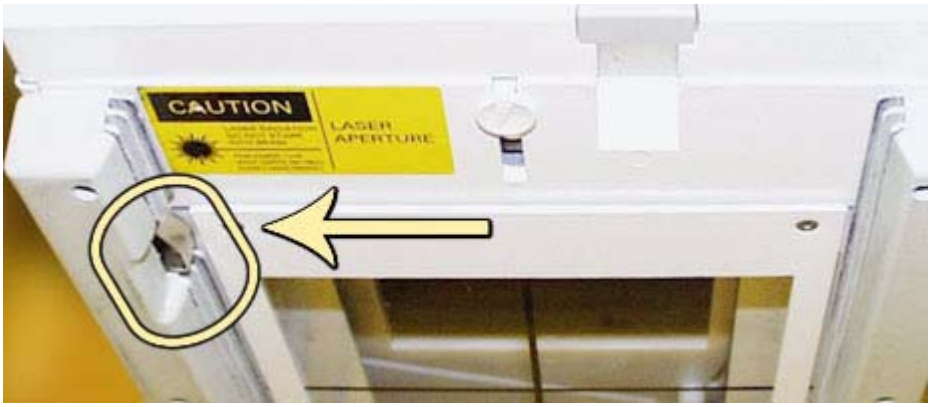
The collimator will display messages indicating an inhibit condition that must be cleared before exposures can be taken.

Locking Lever

The locking lever (Figure 3-15) locks the compensating filters, templates, etc. inserted in the accessory rails of the multi-leaf collimator in place to prevent them from falling out.

NOTE: To remove an accessory from the collimator, the locking lever must be pressed in until the compensating filter, templates etc., can be removed.

Figure 3-15 Collimator Locking Lever



Rotating the Multi-leaf Collimator

The collimator can be rotated 90 degrees around the vertical axis, by releasing the collimator locking lever (Figure 3-16). This allows you to align the collimator field with the anatomy to be exposed. This function is especially useful when imaging extremities.

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Figure 3-16 Rotating the collimator

WARNING: Always grasp the multi-leaf collimator in such a way that neither hand can be pinched or crushed between the handles and the collimator.

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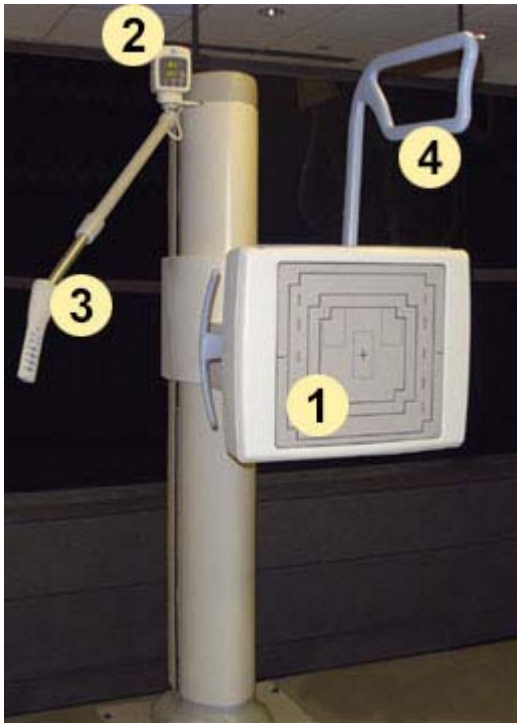
Digital Wall Stand

The digital wall stand (Figure 3-17) contains the digital detector, which can be moved to accomplish different radiographic procedures. The detector is equipped with removable 100cm, 130cm (optional), and 180cm Focal Field Distance (FFD) grids. You have the choice of acquiring images with or without the grid. Grid exams require inserting either the 180cm FFD or the100cm FFD grid. Grids are stored in the wall mounted accessories box. To remove the grid, lift the rose 100 cm or blue 180cm colored chin rest out of the wall stand or accessories holder by using the chin rest edge. To insert it, slide the grid through the groove on top of the wall stand or accessories holder until it rests completely in slot. An interlock within the detector senses the new grid. If the incorrect SID is attempted, exposures are not permitted. Photo-timing is controlled using a three cell ion chamber similar to the device used in conventional radiographic systems.

Figure 3-17 Wall stand



1. Wall Stand Detector
2. Settings Display
3. Remote Handheld Control
4. Lateral Positioning Bar

The digital wall stand is equipped with a lateral positioning bar (Figure 3-24) to aid in patient positioning. Positioning of the Digital Detector is accomplished by using the handheld control illustrated in Figure 3-25. Care should be taken when placing lead markers on the detector to ensure proper visualization on the digital image. Refer to *Chapter 9: General Information-Lead Markers* (p. 9-9) for lead marker information.

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Wall stand characteristics:

IMPORTANT!: The wall stand is **not** a weight-bearing device.

- The vertical height of the detector is adjustable to facilitate proper positioning.
- The tilt feature allows you to tilt the detector –20° to +90° in order to acquire extremity or special imaging exams.
- Positive beam limitation (automatic collimation) is available at 1 meter (40 inches) and 1.8 meter (72 inches) SID for 0° tilt and 1 meter (40 inches) SID for 90° tilt. Adjustments outside this range require manual collimation.
- Exposures can be made with the detector tilted at any angle.
- AEC is available at any SID or detector tilt.
- Motorized to enable advanced applications. Refer to *Chapter 13: Advanced Applications and Options* for more information.
- The inherent filtration of the wall stand front panel is less than 0.8 mm of aluminum equivalent at 100 kVp.

NOTE: You should instruct your patient to use the lateral bar and the hand grips when you are positioning the patient at the wall stand.

CAUTION: Make sure your patient does not use the wall stand as a support.

CAUTION: If the patient leans on the wall stand with enough force, the locks may release and the receptor will lower slowly.

CAUTION: - Grid handling: Handle grids with care and place in accessories holder when not in use. Dropping the grid could cause damage and reduced image quality.

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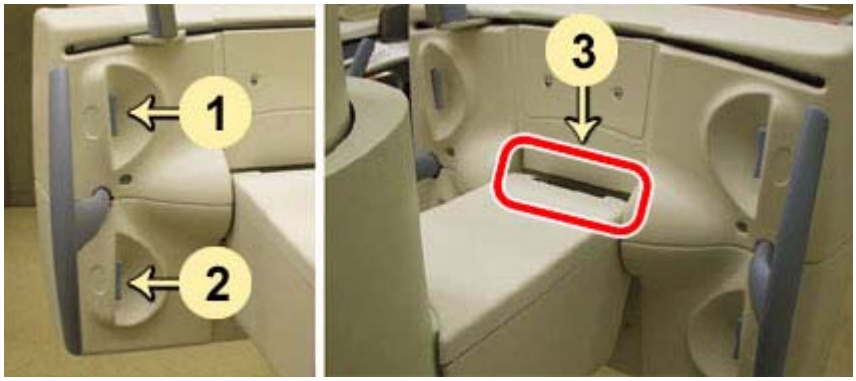
Tilting the Digital Wall Stand Detector

When the wall stand is tilted, you can do multiple exams in a horizontal position. The wall stand can be used for multiple exams; it is important to keep the patient's extremities away from the pinch areas (Figure 3-18).

Figure 3-18 Vertical and tilt controls and pinch area



1. Vertical control
2. Tilt control
3. Pinch area

The tilt lock release button is located in the lower corner of the back of the detector. Detents for the detector tilt are located at 0° (horizontal) and 90° vertical). Lateral detents are active when positioning to the table and wall stand.

WARNING: Lateral Positioning Bar must be removed before tilting the wall stand in order to avoid collisions.

CAUTION: Patients should be clear of the wall stand when tilting is in process.

CAUTION: Make sure your patient does not use the handgrips for support.

CAUTION: Be careful of the handgrips that stick out below the wall stand when positioning wheelchair patients under the wall stand.

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4-cell Ion Chamber Option

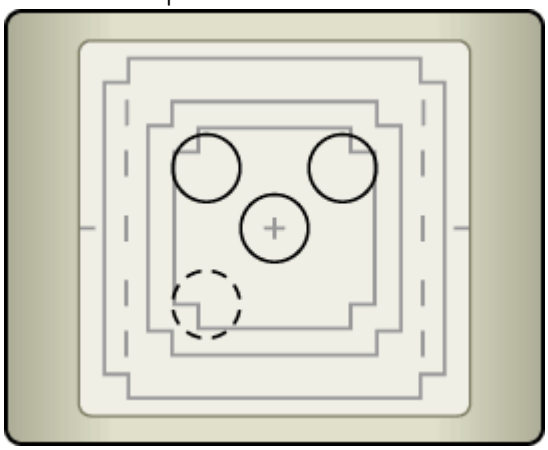
A wall stand receptor with an additional AEC ion chamber is a purchasable option. The fourth chamber is more effective when the receptor is used horizontally under a mobile table accessory.

Refer to *Chapter 4: Automatic Exposure Control (AEC)* for more information about AEC exposures and ion chamber selection.

NOTE: The following figures are for illustrative purposes only and do not represent true scale.

The ion chambers are round with the fourth chamber shown on the wall stand as a dashed outline (Figure 3-19).

Figure 3-19 Front of wall stand receptor with four ion chambers



When the receptor is at or near 0° (vertical), the three main chambers are active and the fourth (lower left) is disabled (Figure 3-20).

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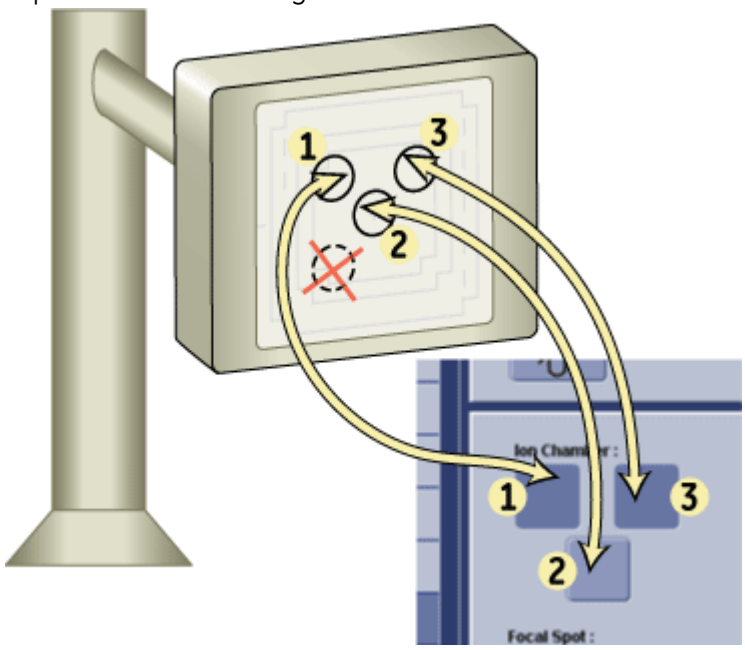
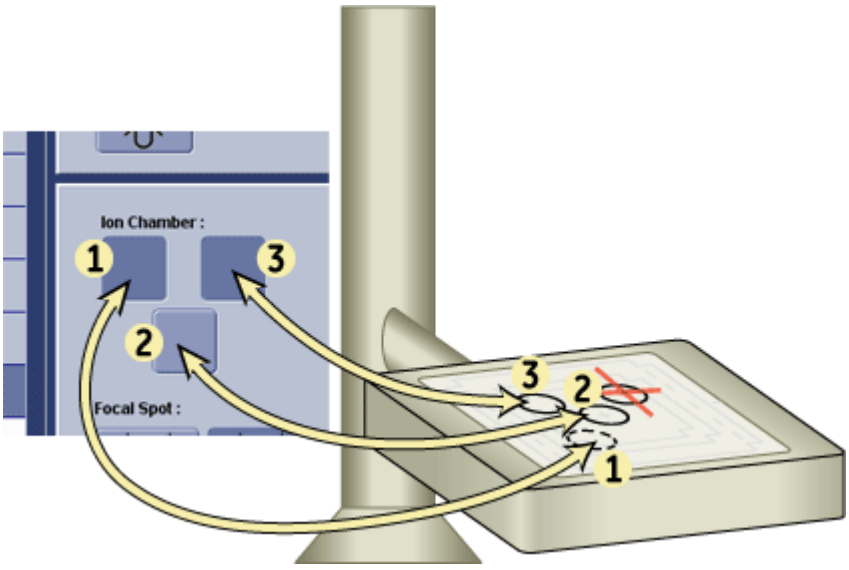
Figure 3-20 Receptor in vertical configuration



When the receptor is at or near 90° (horizontal), the fourth chamber becomes enabled and the top right chamber becomes disabled (Figure 3-21). On the Image Acquisition screen ion chamber selection, the “dashed” ion chamber is assigned to position 1.

Figure 3-21 Receptor in horizontal configuration



The wall stand will determine the angle of the detector and switch configurations appropriately. When the receptor is at an intermediate angle, only the center chamber (2) will be available for section from the Image Acquisition screen.

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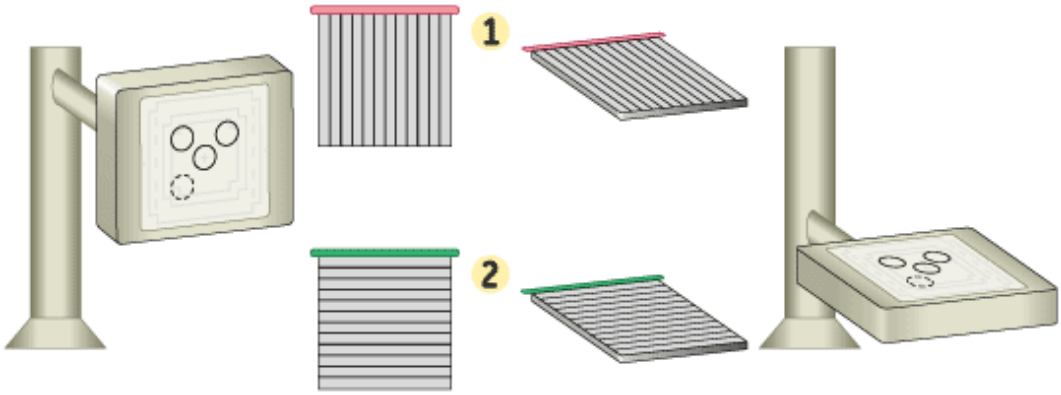
The cross table grid may be used when the receptor is in the horizontal position (Figure 3-22).

Figure 3-22 Grid use



1 Standard grid

2 Cross-table grid

Mobile Stretcher

A mobile table accessory (Figure 3-23) can only be used with an extendable arm wall stand.

Figure 3-23 Mobile table accessory

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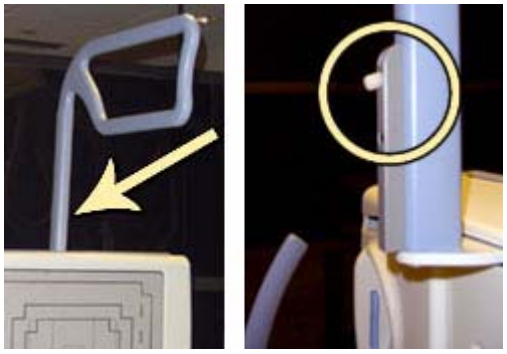
Lateral Positioning Bar

The lateral positioning bar allows for greater patient stability when performing exams in the upright position. The lateral positioning bar release is located on the lower end of the bar as it connects to the detector. Figure 3-24 shows an example.

Figure 3-24 Lateral positioning bar and Release button



Remove and Attach the Lateral Positioning Bar

The positioning bar should be removed before tilting the detector. Use this procedure to remove and attach the lateral positioning bar.

1. Press the Release button on the lateral positioning bar and lift the bar out of the holder. The release button is located on the lower portion of the lateral positioning bar.

CAUTION: This bar is a hand rest only and is not intended to support a person's full weight. To avoid falls and potential injuries, do not hang or pull on the bar.

CAUTION: If the patient pulls on the lateral bar with enough force, the locks may release and the receptor will lower slowly.

CAUTION: Use care not to drop lateral bar when handling. Place on accessories holder when not in use.

CAUTION: When you are at the minimum SID, remove the lateral bar.

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Tube Stand Controls

The Tube Stand controls make special positioning possible by allowing you to override some features of the system.

Operator Override Switch

The optional Operator Override Switch lets you offset the tube from the detector. This means the tube will no longer track to the chest stand. This option is necessary for special X-ray procedures.

In Position Feedback

The In Position feedback signal indicates when the X-ray tube and the Vertical Receptor Stand detector are in alignment.

Tube Warm-up Misalignment

Upon receipt of the TUBE WARM-UP signal from the positioner controller, the Tube Stand servo controller makes the In Position feedback signal inactive. If the Vertical Receptor Stand detector position is greater than the midpoint of its travel, the tube stand moves the X-ray tube focal spot down to 250 mm below the center point of the detector. If the Vertical Receptor Stand detector position is less than the midpoint of its travel, the tube stand moves the X-ray tube focal spot up to 250 mm above the center point of the detector. When the X-ray tube and detector are successfully misaligned, the In Position feedback signal becomes active. The drive speed is the same as in the normal tracking mode. Motion in this mode is interlocked with the Motion Enable signal.

Vertical Drive Manual Override

The Tube Stand allows for manual positioning of the X-ray tube for unique non-aligned exposures. This feature could also be used if the detector tracking function were inoperable, as would be the case if the position feedback from the Vertical Receptor Stand or Tube Stand were defective.

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Handheld Control

The handheld control (Figure 3-25) is attached to the wall stand and allows you to set the field of view, manually collimate, or enable the collimator lamp. Refer to Table 3-8 for detailed information.

Figure 3-25 Handheld control

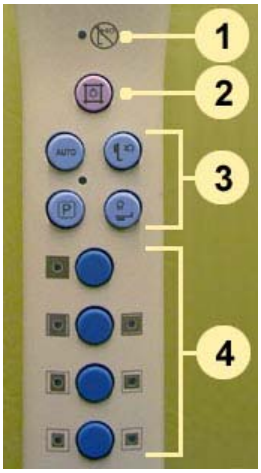

Table 3-8 Remote handheld controls

Item	Description
1. Not ready for wall stand exposure LED	The LED lights up when the system is inhibited from taking a wall stand exposure. (This includes Image Pasting and VolumeRAD exams and any digital wall stand exams in both FIXED and AEC modes.) The LED remains off when the system is ready for exposure or the wall stand receptor is not selected.
2. Collimator Lamp Control	This controls lamp illumination., Pressing once turns on the lamp for 30 to 60 seconds. Pressing again, while the lamp is illuminated, shuts the lamp off.
3. Auto Positioning Buttons	If enabled, moves the tube to one of 3 pre-defined positions. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more information. If Auto Positioning is not enabled, the buttons do not function.

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Item	Description
4. Default FOV Position Buttons	These four buttons allow you to select from four preset collimator blade positions. • 41x41 cm (16x16 inches) • 35x41 cm (14x16 inches) • 24x30 cm (10x12 inches) • 18x24 cm (8x10 inches)

Foot Control

The foot control (Figure 3-26) moves the detector vertically.

1. Press the UP or DOWN pedal two consecutive times (“double-tap”) and hold. This activates the foot pedal.
2. Hold the foot pedal down until the desired height is reached.
3. Release the pedal to stop movement.

Figure 3-26 Foot control

1. Up
2. Down

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Digital Table

The table includes the digital detector, removable grid, foot pedals, and Emergency Stop buttons.

Figure 3-27 Digital Table

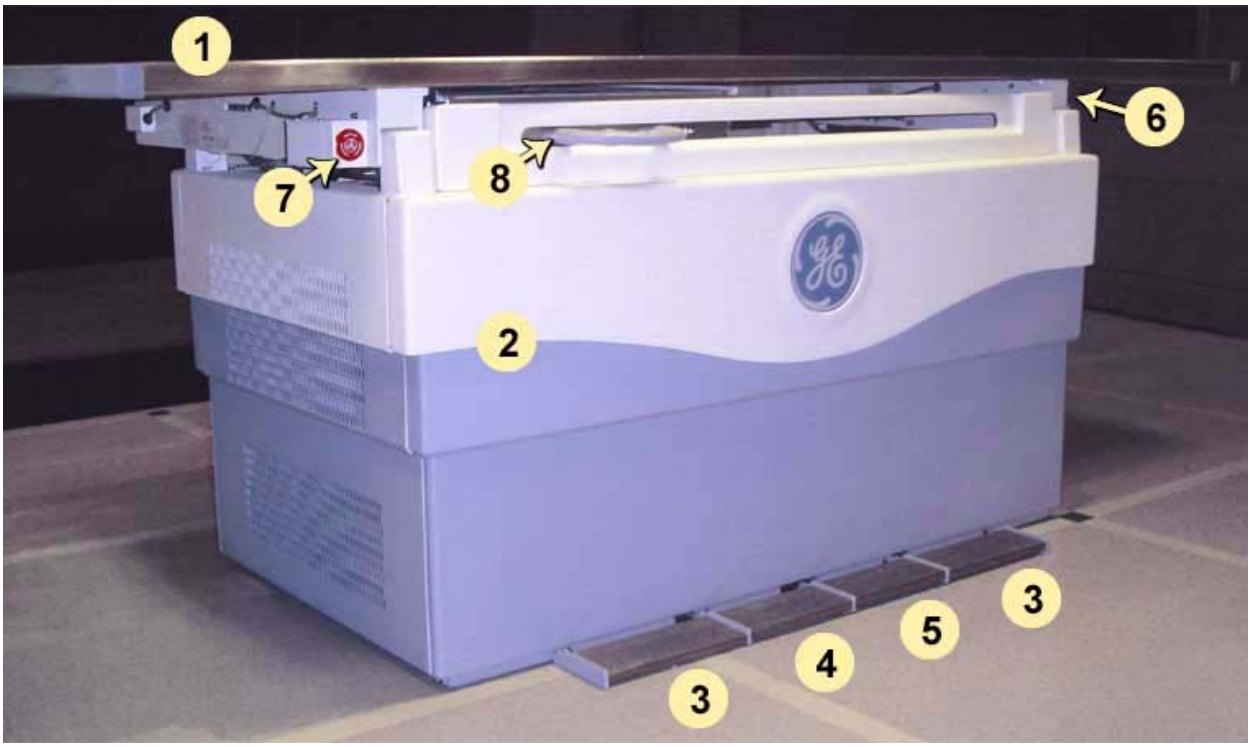

Table 3-9 Digital table components

Item	Description
1. Tabletop	The table dimensions are 2,100 mm (83.0 in) in length and 840 mm (33.0 in) in width. Its inherent filtration is less than 0.75 mm of aluminum equivalent at 100 kVp. The tabletop can be moved longitudinally and transversely for easy patient positioning. Even when it is fully extended, it can support a supine patient weighing up to 220 kg (485 lbs.).
2. Elevating Base with Telescopic Covers	The elevating base raises the tabletop to a maximum height of 820 mm (32.0 in) and lowers it to a minimum height of 520 mm (20.0 in)(+/- 10mm). The telescopic covers are assembled in two levels. Their purpose is to cover the table power supply and the electronic and mechanical components located in the table base. This is essential when the tabletop is raised or lowered.

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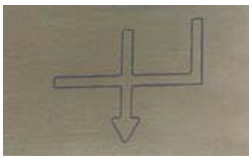
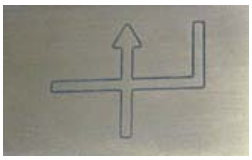
Item	Description
3. Table Positioning Foot Pedals	This pedal allows you to move the table in all directions: longitudinally and transversely. This is known as a floating tabletop. Press the pedal twice and hold down to move the table top.
4. Down Pedal 	The Down pedal lowers the digital table down. Press the pedal twice and hold down to lower the table.
5. Up Pedal 	The Up pedal raises the digital table up. Press the pedal twice and hold down to raise the table.
6. Table Lock Control Buttons	There are two lock buttons located on the side on the table, near the head and foot of the table. They are used to prevent the table up-down and tabletop movement. The lock is engaged when the button is lit.
7. Emergency Stop Buttons	There are two Emergency Stop buttons located on the left and right sides of the table. These buttons are used to remove power from the table in an emergency.
8. Manual Detector Position Button	The Manual Detector Position button is used for detector placement if auto-tracking fails.

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Item	Description
Hand Grips	Two hand grips are optional with the system. These serve to maintain the patients' hands away from the tabletop edges and to give patients a feeling of security. The grips are not intended to support the weight of patients. For increased patient safety, the patient hand grips can be used during all examinations. The grips slide onto the side rails of the tabletop. They can be locked in place in any position along the side rails with the thumbscrews. Refer to *Install or Adjust Compression Band and Hand Grips* (p. 3-42) for more information.
Abdominal Compression Band (clamp only shown)	The Abdominal compression band option is a fabric band, secured at the table edge, by the clamp shown. The compression band allows the user to place the band over the patient to provide IVP compression as requested by the Radiologist. It can also be used to help in reduction of patient movement in some instances, at the technologist's discretion. Patients should be monitored at all times and not be left unattended. Refer to *Install or Adjust Compression Band and Hand Grips* (p. 3-42) for more information.

NOTE: The table is equipped with a collision detection system. If contact is made between the tabletop and a foreign object, such as a stool, while lowering the tabletop, the requested motion automatically stops until the collision condition is removed. This is accomplished by either clearing the foreign object from the tabletop movement path or by requesting the reverse movement of the tabletop.

WARNING: When the Manual Detector Position Button is pressed, the automatic detector tracking mechanism is disabled. To re-enable automatic detector tracking, move the OTS.

WARNING: Before your patient gets onto or off from the digital table, always press the Table Lock Control button to block the foot pedal functions momentarily. This avoids injuries to the patient or damage to the equipment if a foot pedal is accidentally stepped on.

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WARNING: To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

Use the Emergency Stop Button

The digital table is equipped with Emergency Stop buttons located on the left and right side of the table. Use this procedure to perform an emergency stop and to reset the Emergency Stop button.

1. In an emergency situation, press the Emergency Stop button in with force.

Figure 3-28 Emergency Stop button

2. Resolve the emergency situation.
3. When normal conditions are confirmed, turn the button clockwise.
4. At the Acquisition workstation, click the [OK] button on the Emergency Stop screen (Figure 3-29).

Figure 3-29 Emergency Stop screen

- The system will power up automatically.

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WARNING: When the Emergency Stop button has been activated, the table will move freely. The table is not locked into position. Exercise extreme caution with your patient when this happens.

Raise and Lower the Digital Table

The height of the digital table can be adjusted to make it easier for your patient to get on and off the table and for you to position the patient for the examination.

WARNING: Before your patient gets on or off the digital table, always press the Table Lock Control button to block the control foot pedal functions momentarily. This avoids injuries to the patient or damage to the equipment if a foot pedal is accidentally stepped on.

Use this procedure to raise and lower the digital table.

1. Release the table lock, if necessary.
2. To raise the table, press the Up pedal two consecutive times (“double-tap”). This activates the foot pedal.
3. Hold the foot pedal down until the desired height is reached.

NOTE: The tabletop automatically stops when it reaches its maximum height of 820 mm (32.0 inches).

4. Remove your foot from the pedal to stop the movement.
5. To lower the table, press the Down pedal two consecutive times (“double-tap”).
6. Hold the foot pedal down until the desired height is reached.

NOTE: The tabletop automatically stops when it reaches its minimum height of 520 mm (20.0 inches).

7. Remove your foot from the pedal to stop the movement.

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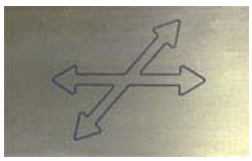
Position the Table Longitudinally and Transversely

The digital table position can be adjusted in the longitudinal and transverse directions for greater patient positioning flexibility. Use this procedure to position the tabletop in the longitudinal and transverse directions with respect to the X-ray tube.

1. Release the table lock, if necessary.
2. Press the either outer foot pedal (Figure 3-30) two consecutive times ("double-tap"). This activates the foot pedal.

Figure 3-30 Table top positioning foot pedal



3. Hold the foot pedal down and position the table top.
   - You can float the table top in all directions while the pedal remains held down.
4. Manually move the tabletop in a longitudinal or transverse direction to the desired position.
5. Release the foot pedal to lock the tabletop.

WARNING: When moving the tabletop, be careful of where your and the patient's fingers are placed. Do not attempt to move the tabletop without using the foot pedals to release the longitudinal and transverse movement locks.

WARNING: To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

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Adjust the Overhead Tube Suspension (OTS) Position

The OTS components can be moved in several directions to properly position the unit during a patient examination. The User Interface is used to control the motions. Use this procedure to learn how to position the OTS.

NOTE: The steps of this procedure can be performed in any order and not all of the steps are required. You do not have to follow this exact sequence. This procedure is intended to help you learn the various methods of positioning the OTS.

1. Use the Longitudinal Lock Release button to move the OTS along the bridge of the overhead rail system.
   a) Press and hold the Longitudinal Lock Release button on the User Interface.
   b) Move the OTS to the desired position.
   c) Release the Longitudinal Lock Release button.
2. Use the Vertical Lock Release button to move the telescopic column up and down.
   a) Press and hold the Vertical Lock Release button on the User Interface.
   b) Move the telescopic to the desired vertical position.
   c) Release the Vertical Lock Release button.
3. Use the Lateral Lock Release button to move the OTS carriage from side to side on the bridge.
   a) Press and hold the Lateral Lock Release button on the User Interface.
   b) Move the OTS carriage to the desired position.
   c) Release the Lateral Lock Release button.
4. Use the All-Lock, Lock Release button to simultaneously move the OTS in vertical, lateral and longitudinal directions.
   a) Press and hold the All-Lock, Lock Release button on the User Interface.
   b) Move the OTS to the desired position.
   c) Release the All-Lock, Lock Release button.

NOTE: Detents remain activated if the detent button is selected.

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Install or Adjust Compression Band and Hand Grips

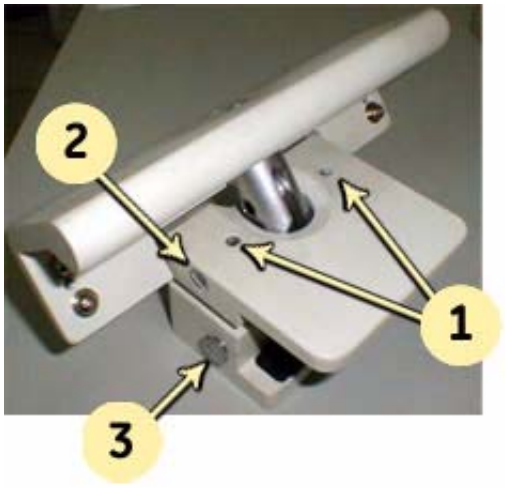
There are two optional accessories available for the digital table:

- Abdominal compression band (with clamp)
- Patient hand grips

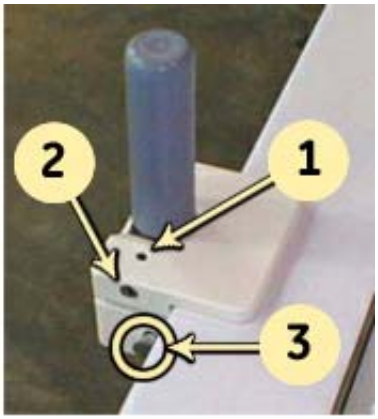
The compression band camp and hand grips (Figure 3-31) slide onto the side rails of the tabletop. They can be locked in place in any position along the side rails with the thumbscrews.

Figure 3-31 Accessories overview

Compression Band (clamp)



Patient Hand Grip



1 Adjustment screw

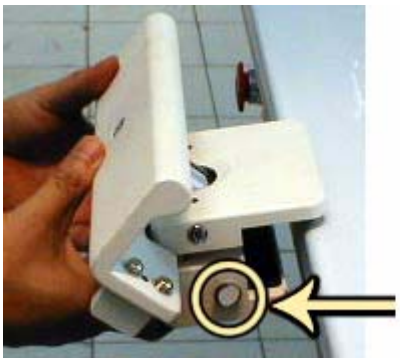
2 Safety screw

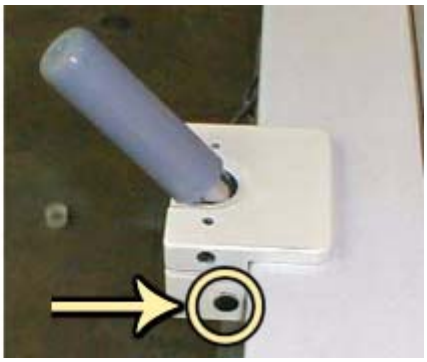
3 Lock

Installation

1. Depress the lock to release the clamp or hand grip (Figure 3-32).

Figure 3-32 Clamp and hand grip released





2. Position the clamp or hand grip; then depress the handle.
3. Lock the compression band or hand grip (Figure 3-33).

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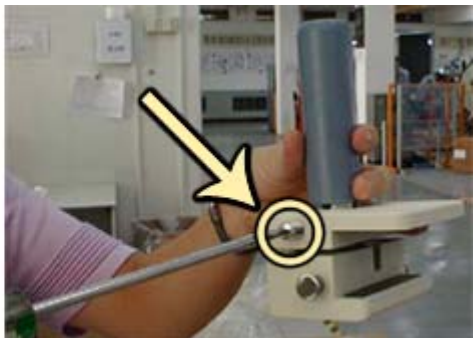
Figure 3-33 Clamp and hand grip locked

Adjustment

1. Depress the lock to release the clamp or hand grip.
2. Position the clamp or hand grip; then depress the handle.
3. Release the two safety screws (Figure 3-34).

Figure 3-34 Safety screws



4. Use an M2.5 Allen key to tighten the two adjustment screws until clamp or hand grip is firmly attached to the table top (Figure 3-35).

Figure 3-35 Adjustment screws

5. Fasten the safety screws.

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Adjust the Tube Position

For certain exams, you may need to angle and/or rotate the tube in order to include all of the required anatomy in the FOV. Use this procedure to adjust the position of the tube.

NOTE: The steps of this procedure can be performed in any order and not all of the steps are required. You do not have to follow this exact sequence. This procedure is intended to help you learn the various methods of positioning the tube.

1. Use the Tube Angulation Lock Release button to rotate the tube about the short axis (cranial to caudal).
   a) Press and hold the Tube Angulation Lock Release button on the User Interface.
   b) Move the tube unit to the desired angle.
   c) Release the Tube Angulation Lock Release button.
2. Use the TSU Rotation Detent Release lever to rotate the tube about the vertical axis of the telescopic column.
   a) Press the Rotation Detent button on UI (lower right).
   b) Rotate the tube unit.
   c) Release the button to hold position.

WARNING: - Potential Pinch Point: The area where the tube connects to the column may create a pinch point when the tube is rotated. Operators should keep their hands on the OTS handle and keep patient's clear while rotating the tube.

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Rotate the Multi-Leaf Collimator

For certain exams, such as extremities, you may need to line the collimator field up with the anatomy to be exposed. Use this procedure to rotate the multi-leaf collimator around the vertical axis.

1. Move the locking lever on the multi-leaf collimator toward the front panel, i.e. toward you. This releases the collimator from the 0 lock-in position.
2. Grasp the multi-leaf collimator with both hands.
3. Rotate it to the desired angle and direction.
4. Return the locking lever to its original position. This prevents further rotation.

NOTE: When the collimator is rotated, the image border is adjusted to the maximum size based on the selected collimator FOV.

WARNING: Always grasp the multi-leaf collimator in such a way that neither hand can be pinched or crushed between the handles and the collimator.

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Image Pasting Patient Positioner

Image Pasting is a purchased option for the Definium 8000. Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more information. The positioner is used to determine the correct Center of Interest (COI) and to accurately re-construct images.

Figure 3-36 Image Pasting patient positioner

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System Cabinet

The system cabinet (Figure 3-37) houses the electronics for the Definium 8000. GE Service personnel can open the front of the cabinet to access the electronics.

The cabinet is 130.17 cm (51.25 in.) high—not including the back flange, 90.80 cm (35.75 in.) wide, and 71.75 cm (28.25 in.) deep.

Figure 3-37 System cabinet

Figure 3-38 System cabinet with front open

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Grids

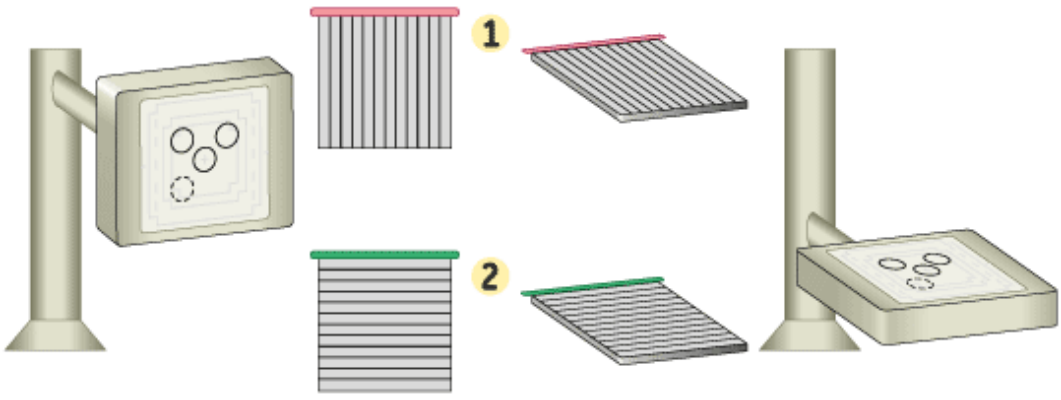
The Definium 8000 comes with 4 grids standard and 2 grids for optional purchase. Table 3-10 lists the focal distance, ratio, line pairs, and orientation of each grid.

Table 3-10 Grids

Grid	Nominal Focal Distance	Ratio	Line Pairs	Grid Line Orientation
1. Wall stand	100cm (40in.)	13:1	70lines/cm	Vertical
2. Wall stand - Midrange (This grid is optional.)	130cm (52in.)	10:1	70lines/cm	Vertical
3. Wall stand	180cm (72in.)	13:1	70lines/cm	Vertical
4. Table	100cm (40 in.)	12:1	70lines/cm	Vertical
5. Cross-table (This grid is optional.)	TBD	TBD	TBD	Horizontal

The cross-table grid may be used when the receptor is in the horizontal position (Figure 3-39).

Figure 3-39 Grid use



1 Standard grid

2 Cross-table grid

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Grid and Accessories Holder

A holder to store grids and the composite QAP phantom is available for optional purchase. It is recommended that grids and phantoms be stored in the holder when not in use. The holder is mounted on the wall and can store up to 4 grids and phantoms.

Figure 3-40 Holder with grids and QAP phantom

X-ray Exposure Lamp

When X-rays are being produced in the radiographic mode, the red X-ray exposure indicator lights up in red on the RCIM (Figure 3-41). The console beeps as X-rays are produced when the X-ray Prep/Expose button on the Hand-switch is pressed. The tone ends when the exposure is terminated or completed.

Figure 3-41 X-Ray exposure lamp on RCIM

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Chiller

For optimal image quality and high detector reliability, the detector temperature should be between 25–35° C (77–95°F). A chiller (Figure 3-42) is provided to ensure this temperature range. If the detector temperature is outside of this range the image may become noisy or artifacts may be seen. A warning message will appear to notify you that the detector temperature is out of range. If the detector reaches a temperature above 48°C (188.4°F), the system will show an error and the detector will be switched off. Service should be called.

Figure 3-42 Chiller

WARNING: Do not step or stand on the chiller. The cover may break and damage the electronics.

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Chapter 4
Automatic Exposure Control (AEC)

The Automatic Exposure Control automatically terminates an X-ray exposure to produce optimum quality images. AEC automatically compensates for changes in patient thickness, opacity, and different technique factors of mA, kVp, and SID. Proper patient positioning is very important. In extreme cases of misalignment, some radiation bypasses the patient and ends the exposure prematurely, causing underexposed images. Conversely, positioning the heaviest patient area over the detector sensing area may cause overexposed image areas. You should become familiar with the size and location of each detector. With such knowledge, you can develop proper positioning techniques of each anatomical area and be able to duplicate your positioning for every patient. This also helps you produce uniform quality images regardless of patient thickness or opacity. This system feature, AEC, automatically selects the mAs and exposure time, eliminating the need for you to select them.

Many default techniques are AEC based. The exposure time and mAs are automatically selected when you are in AEC mode, producing uniform quality images.

Topics covered include:

- *Console Screens* (p. 4-1)
- *Ion Chamber Detectors* (p. 4-4)
- *Applications for Detector Sensing Areas* (p. 4-4)
- *AEC Limitation Messages* (p. 4-7)
- *Acquire AEC Images* (p. 4-8)

Console Screens

Figure 4-1 shows an example of an AEC exposure setup. For AEC mode, exposure time and mAs are not selectable; therefore, these parameters are empty on the Acquisition screen. This example provides an example an AEC exposure with Chest AP selected.

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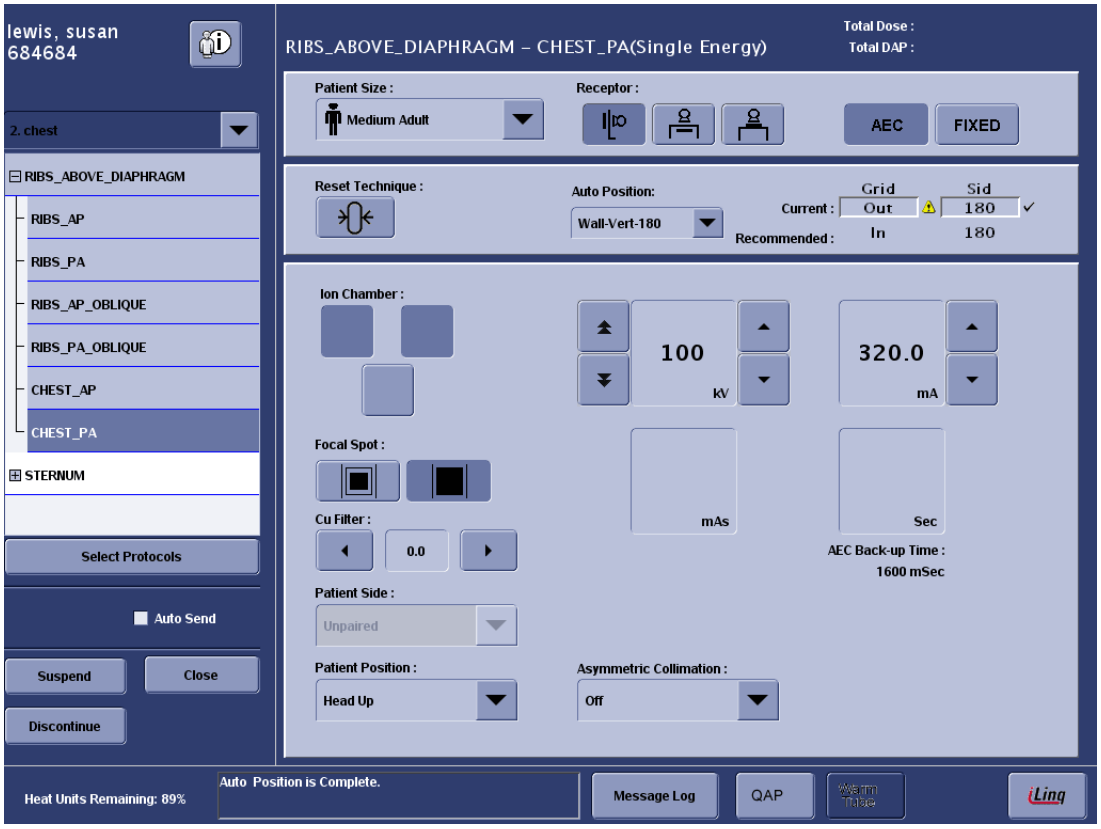
Figure 4-1 Example AEC setup of a normal chest exposure



After the exposure has been completed, the console automatically displays the exposure time (mSec) and mAs values (Figure 4-2).

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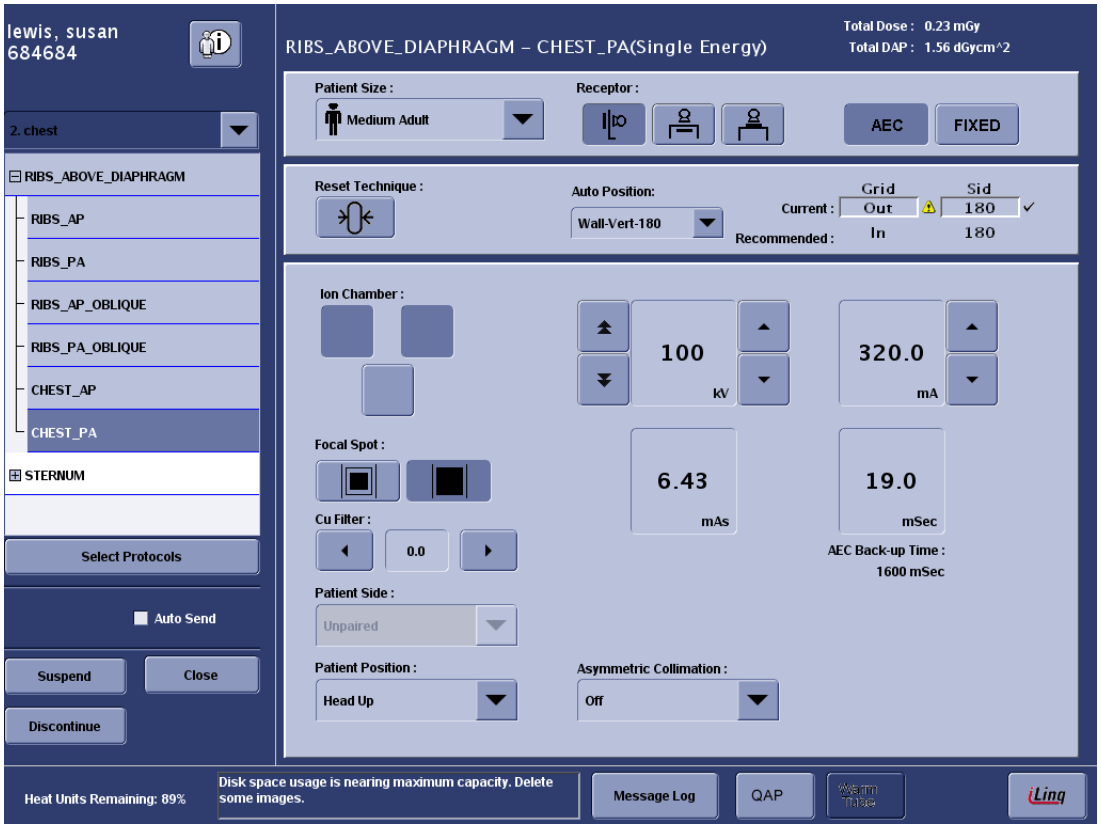
Figure 4-2 Example AEC exposure completed (normal operation)



The Applications software sets two limits for AEC operation: 512 is the maximum mAs. 2 seconds (2000 milliseconds) is the maximum exposure time.

NOTE: When either one of the above limits is reached, the Applications software terminates the exposure. For example, Equation 4-1 demonstrates that with a console selection of 250 mA, the system reaches the 2000 millisecond maximum exposure limit before it would reach the 512 mAs limit.

Equation 4-1 AEC exposure limit calculation

(the 250 mA console selection) X (2000 milliseconds) = 500 mAs

NOTE: The Applications software also uses a built-in formula to set limits for AEC operation in addition to the two limits stated above. This formula limits mAs to a value less than 512 mAs and exposure time to a value less than 2000 msec, depending upon the technique selected. Due to these limitations, you may reach an AEC limit even with a mAs value less than 512 mAs and with an exposure time less than 2000 msec. If either of these events occur, the Applications software terminates the exposure.

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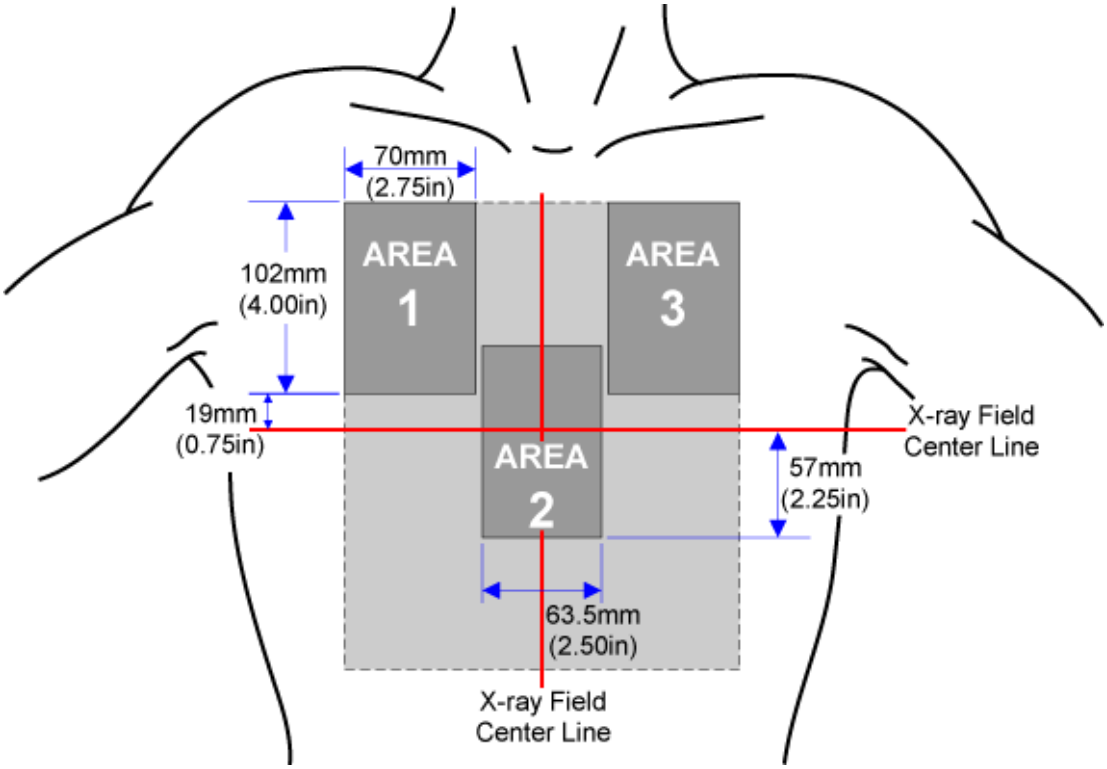
Ion Chamber Detectors

Ion Chamber Detectors have three sensing areas (Figure 4-3). Sensing Area 2 is located at the center of the X-ray beam. While Area 1 and Area 3 can be selected to cover an exposure of two symmetrical parts of the body, such as the lungs or the kidneys, care should be taken to center the patient and detector areas accordingly.

Some facilities may be equipped with a 4-cell ion chamber wall stand for use with a mobile table accessory. Refer to *Chapter 3: Hardware Overview-4-cell Ion Chamber Option* (p. 3-28) for more information.

Figure 4-3 Sensing areas



The position of the sensing areas are shown in relation to the area of a 210 mm x 248 mm (8.25in x 9.75in) Collimator Light Field.

Applications for Detector Sensing Areas

The detector sensing areas should be used as described in the following sections. You should become familiar with their locations and recommended use. The sensing areas are numbered 1 through 3.

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Areas 1 and 3

Areas 1 and 3 are used to cover symmetrical body parts. For example, acquiring a chest radiograph includes the lungs, which are proportional parts of the body. In this application, Area 1 and 3 must be located in line with radiation transmitted through the left and right lung fields. This ensures these areas are not influenced by variations in tissue opacity caused by the heart or vertebrae.

If the patient is improperly positioned and the sensing areas are exposed to direct radiation, the photo timed exposures will be too short and the films underexposed. The opposite is true if the patient's thoracic spine or sternum are positioned over the sensing areas.

NOTE: Areas 1 and/or 3 are to be used with full-sized fields of 10x12 inches (254x305mm) or larger.

Area 2

The center of the X-ray beam is Area 2. The basic positioning requirements are also important when using this area. Misalignment may result in unusable images. Care should be taken when positioning the anatomical area of interest over Area 2.

When using Area 2, you may want to align the X-ray tube to the center line of Area 2 before positioning the patient. It is also recommended you collimate the light field to an area of 8¼x9¾ inches (210x 248 mm). Your light field will then be centered on Area 2 and encompasses the inner sides of Area 1 and 3. Then, when you are positioning your patient and using only Area 2, a light field 2½x4½ inches (54x114 mm), if properly centered, defines that area and can be used to align a specific region of the body.

Positioning of the patient's anatomical area of interest within the light field and readjusting the light field to the desired size, ensures the detector sensing area is aligned with the area of interest in the patient.

NOTE: Area 2 must be selected by itself whenever the X-ray field is less than 10x12 inches (254x305 mm) and in instances where the collimator field size is reduced to less than 10x10 inches (254x254 mm).

Applications

Applications for the detector sensing areas are given in Table 4-1 with the areas appearing as three adjacent square buttons. The dark-colored buttons indicate the currently selected area or areas.

When in AEC mode, at least one ion chamber must be selected. Any combination of chambers is allowed.

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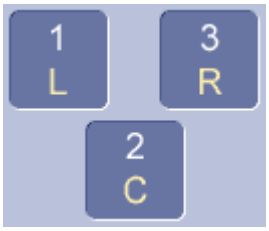
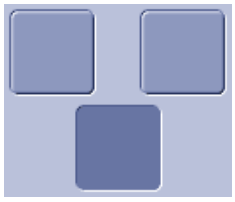
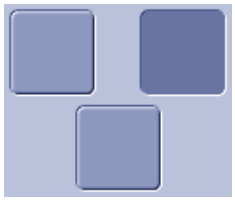
Figure 4-4 AEC Areas



NOTE: When creating or editing protocols, the ion chambers are named L, R, and C on the Exam Menu screen. Refer to *Chapter 12: Set Preferences-Protocols* (p. 12-42) for more information.

NOTE: Some facilities may be equipped with a 4-cell ion chamber wall stand. Refer to *Chapter 3: Hardware Overview-4-cell Ion Chamber Option* (p. 3-28) for more information about how this affects ion chamber selection when used horizontally with a mobile table accessory.

Table 4-1 Detector sensing areas

Area(s) Selected	Application	Patient Positioning
Area 2 	Controls the exposure for an area of interest at the center of the X-ray field.	The patient's area of interest is in the X-ray field center.
Area 1	Controls the exposure for an area of interest at the upper left quadrant of the full size radiograph.	The patient's area of interest is in the upper left quadrant of the X-ray field.
Area 3 	Controls the exposure for an area of interest at the upper right quadrant of the full size radiograph.	The patient's area of interest is in the upper right quadrant of the X-ray field.

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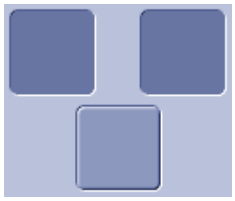
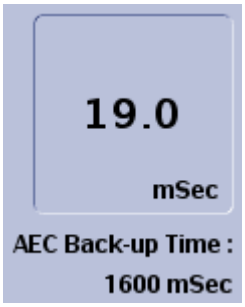
Area(s) Selected	Application	Patient Positioning
Areas 1 and 3 	Controls the exposure for two symmetrical parts of the body, such as lungs or kidneys. Because Area 2 is not selected when using areas 1 and 3 for this application, the vertical column should not affect the exposure, providing the patient is correctly positioned.	The patient's area of interest is aligned with sensing Areas 1 and 3.
All Areas	Controls the exposure to allow the average density of the entire radiograph to approximate the value of the pre-selected density.	The patient's area of interest is within the boundary of the X-ray field.

AEC Limitation Messages

The AEC feature optimizes patient images and helps you to obtain precise exposures. Many default techniques are AEC based. The exposure time and mAs are automatically selected when you are in AEC mode, producing uniform quality images. The system displays messages to inform you when the AEC feature reaches its limit.

When acquiring AEC images, the AEC Back-up time is displayed below the mSec area. After the exposure is taken, the current mSec is displayed (Figure 4-5).

Figure 4-5 mSec and AEC back-up time on Acquisition screen



When an AEC exposure reaches the back-up time limit, a message appears on screen: "The AEC back-up time has been reached." Click [OK] to close the message. The system will not allow you to continue taking exposures for the current protocol. To resume image acquisition, select another protocol and continue the exam.

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The backup time is calculated from the following three conditions:

- A 2000 millisecond limit
- A 500 mAs limit or 512 mAs limit (based on the nearest Renard step)
- An X-ray tube protection 'formula' limit

In this instance, the maximum exposure time reached may cause the digital image to be lighter than desired. You may wish to change the mA selected to avoid reaching one of these limitations in a subsequent exposure.

In addition to the limits provided by the Applications software, the system also has a maximum mAs limit for AEC operation.

- The maximum mAs limit ensures that if an AEC exposure exceeds 512 mAs, the maximum mAs limit terminates the exposure at values less than 600 mAs.
- Whenever the maximum mAs integrator limit (550 mAs ± 10 mAs) is reached during an AEC exposure, a message appears: "The AEC back-up time has been reached."

NOTE: The regular occurrence of this message may be evidence of a malfunction in your system. Call your service engineer to assess the situation.

Acquire AEC Images

Acquiring images in the AEC mode requires precise light alignment and patient positioning.

Refer to *Chapter 6: Image Acquisition* for more information about conducting an exam.

WARNING: The ion chambers and asymmetric collimation field must match for proper exposure. Collimation must be active over the AEC chambers being used or FIXED mode must be used in order to prevent possible patient over-exposure.

Use this process to produce images with the AEC feature.

1. Open an exam from the Worklist and select the protocols.
   - The Acquisition screen appears.
2. Select the protocol to perform.
3. Change the **Patient Size**, if necessary.

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WARNING: **It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.**

4. Change the **Receptor,** if necessary.
5. Click [AEC], if necessary.
   - Depending on the current protocol, AEC may already be selected by default.
   - The AEC mode displays the Ion Chamber selections.
   - The Fixed mode removes the Ion Chamber selections.
   - You are able to alter this selection at any time to accommodate the requirements of a specific examination.
6. Change the selected **Ion Chambers**, if necessary.
   - Selected (active) AEC cells will appear highlighted on the acquisition screen.

NOTE: Some facilities may be equipped with a 4-cell ion chamber wall stand. Refer to *Chapter 3: Hardware Overview-4-cell Ion Chamber Option* (p. 3-28) for more information about how this affects ion chamber selection when used horizontally with a mobile table accessory.

7. Make other technique adjustments as necessary.
   - You are able to adjust the kV, mA, Focal Spot, and Cu Filter.
8. Position the patient so that the anatomy of interest is centered over the selected AEC cells.

NOTE: The body part must cover the selected ion chambers in order to achieve the appropriate exposure.

9. Collimate the light field to encompass the detection area being used.
10. Align the detector and light field.
11. Collimate to the desired area. This ensures the detector sensing area is aligned with the patient's anatomy.
12. Confirm the Patient Position. Change if necessary.
13. Make the exposure.
14. If the AEC Back-up Reached message appears: Click [OK].
    - The message closes.
15. Select another protocol and continue the exam.

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Chapter 5
Worklist

The Worklist is the starting point for patient set up and selecting procedures for acquisition. All exams begin from this screen.

The Worklist information and functions are based on DICOM standards.

This chapter explains the procedures for entering data into the system and setting up a patient.

Topics covered include:

- *Overview* (p. 5-2)
  - *Patient List Columns* (p. 5-7)
- *Manage List / Find Procedures* (p. 5-8)
  - *Patient List Columns* (p. 5-7)
  - *Search* (p. 5-8)
  - *Sort by Column* (p. 5-9)
  - *Filter List* (p. 5-10)
  - *Refresh* (p. 5-13)
- *Select Procedures* (p. 5-15)
  - *Select a Single Procedure* (p. 5-15)
  - *Select Multiple Procedures* (p. 5-15)
- *Delete Procedures* (p. 5-15)
  - *Delete a Single Procedure* (p. 5-16)
  - *Delete All Completed, Discontinued, and Local Procedures* (p. 5-16)
  - *Delete Suspended Procedures* (p. 5-17)
- *Add Patient / Edit Patient Information* (p. 5-17)
  - *Overview* (p. 5-17)
  - *Add Patient* (p. 5-21)
  - *Edit Patient Information* (p. 5-22)

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Overview

The Worklist (Figure 5-1) appears on the left monitor. It shows scheduled, completed, discontinued, suspended, and active procedures.

The majority of the Worklist is the Patient List. The Patient List is a large table made of standard columns and rows. Each row in the list is a procedure, or exam, to be performed. A patient may have multiple procedures (rows) on the Worklist.

Procedures listed can be classified under two categories:

- Locally entered procedures: This category refers to procedures entered by the user on the workstation, either by manually entering the information or by using an bar code scanner. Locally entered procedures are only available to the workstation that they were entered on. They do not update automatically and no other workstation can access them.
- Hospital Information System (HIS) or Radiology Information System (RIS) Procedures: This category refers to procedures that the Worklist can automatically update from the central HIS/RIS database. Other workstations can be configured to access these procedures.

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Figure 5-1 Worklist screen

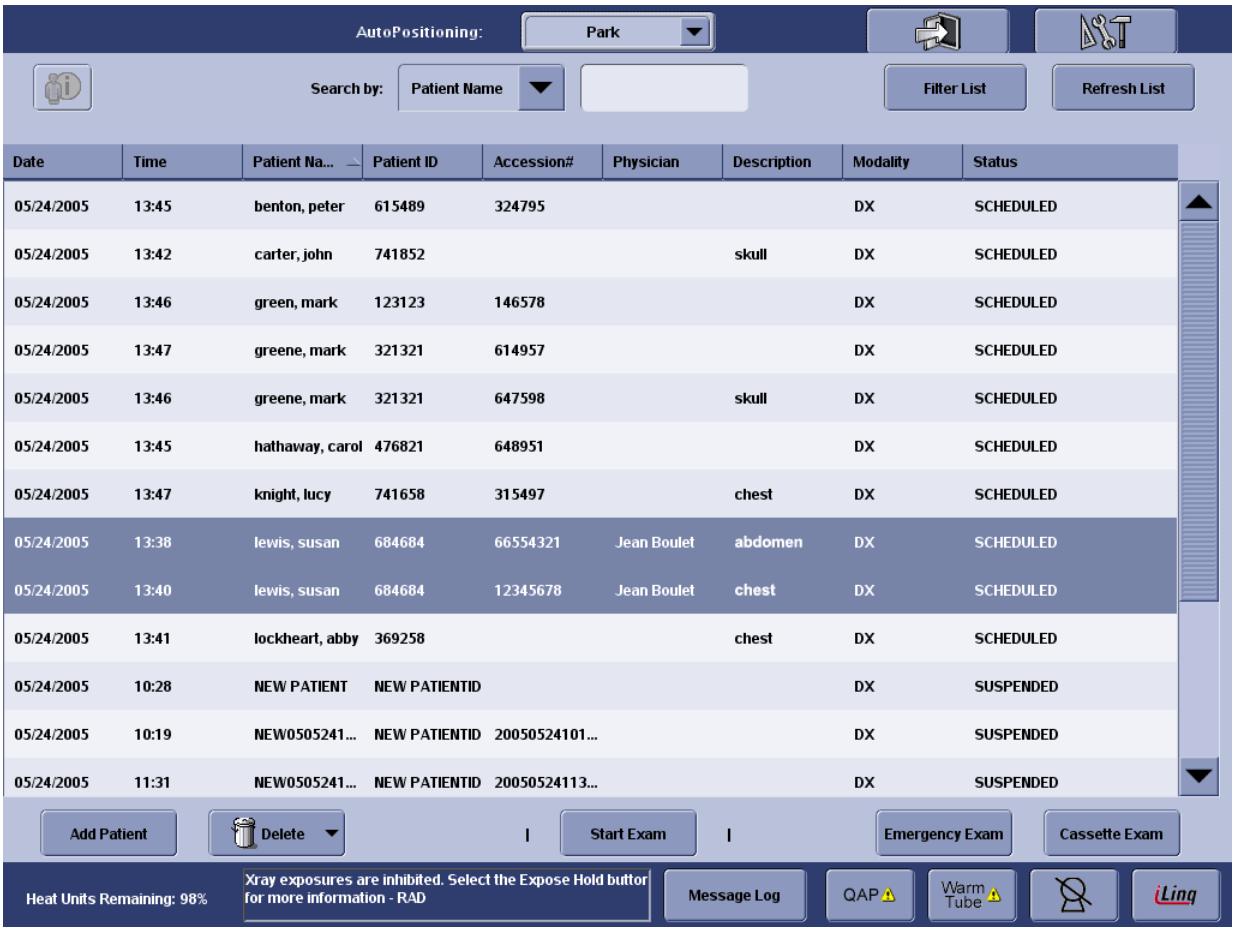
AutoPositioning:
Park
Search by:
Patient Name
Filter List
Refresh List
Date
Time
Patient Na...
Patient ID
Accession#
Physician
Description
Modality
Status
05/24/2005 13:45 benton, peter 615489 324795 DX SCHEDULED
05/24/2005 13:42 carter, john 741852 skull DX SCHEDULED
05/24/2005 13:46 green, mark 123123 146578 DX SCHEDULED
05/24/2005 13:47 greene, mark 321321 614957 DX SCHEDULED
05/24/2005 13:46 greene, mark 321321 647598 skull DX SCHEDULED
05/24/2005 13:45 hathaway, carol 476821 648951 DX SCHEDULED
05/24/2005 13:47 knight, lucy 741658 315497 chest DX SCHEDULED
05/24/2005 13:38 lewis, susan 684684 66554321 Jean Boulet abdomen DX SCHEDULED
05/24/2005 13:40 lewis, susan 684684 12345678 Jean Boulet chest DX SCHEDULED
05/24/2005 13:41 lockheart, abby 369258 chest DX SCHEDULED
05/24/2005 10:28 NEW PATIENT NEW PATIENTID DX SUSPENDED
05/24/2005 10:19 NEW0505241... NEW PATIENTID 20050524101... DX SUSPENDED
05/24/2005 11:31 NEW0505241... NEW PATIENTID 20050524113... DX SUSPENDED
Add Patient
Delete
Start Exam
Emergency Exam
Cassette Exam
Heat Units Remaining: 98%
Xray exposures are inhibited. Select the Expose Hold buttor for more information - RAD
Message Log
QAP
Warm Tube
iLing

Table 5-1 lists and describes all the functions on the Worklist screen.

Table 5-1 Worklist Functions

Function	Description
Auto Positioning 	If enabled, selects a pre-defined position for the x-ray tube. Pressing and holding the AUTO POSITIONING and POWER buttons on the RCIM initiates movement to the selected position. If Auto Positioning is not enabled on your system, the control does not appear. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more information.

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Function	Description
[LOG OFF] 	If the Login function is enabled, logs the current user off of the system. Refer to *Chapter 9: General Information-Login and Log Off* (p. 9-4) for more information.
[UTILITIES] 	Opens a screen where system settings (such as Network and Printer connections) and preferences may be changed. If the Login function is enabled, the preferences you are allowed to change will vary depending on your level of access. Refer to *Chapter 12: Set Preferences* for more information.
[PATIENT INFORMATION] 	Shows the Patient Information screen for the selected procedure. **NOTE:** Patient Information is editable if the currently selected procedure has not been opened. Once the exam starts the Patient Information is no longer editable. Patient Information is not editable if multiple procedures are selected. Refer to *Add Patient / Edit Patient Information* (p. 5-17) for more information.
Search 	Searches for procedures by the selected the column name in the drop-down list and the search criteria entered into the text box. The drop-down list will also sort the list by the selected column name. Refer to *Search* (p. 5-8) for information on searching the list.
[REFRESH LIST] 	Updates the Worklist view with new information from the HIS or RIS, which shows changes to the procedure records. Also removes any filters that have been applied. Refer to *Refresh* (p. 5-13) for more information on automatically refreshing the Worklist.
[FILTER LIST] 	Displays a worklist query screen and filters the list to find procedures that meet specific criteria. The filter includes both RIS or HIS records and locally added procedures. Refer to *Filter List* (p. 5-10) for information on how to filter the Worklist.

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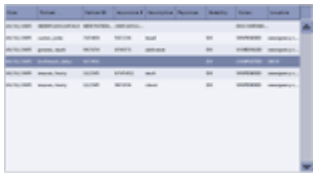
Function	Description
Patient List area 	Shows all procedures scheduled for examinations during a working day. Procedures on the list may be downloaded from the RIS/HIS or may be created locally on the Acquisition workstation. The list may be sorted by column, searched, or filtered. Refer to *Manage List / Find Procedures* (p. 5-8) for more information. The time period displayed is configurable. Refer to *Chapter 12: Set Preferences-Worklist* (p. 12-13) for information on changing the time period displayed.
[ADD PATIENT]	Allows you to enter patient information and adds the patient to the Patient List. Refer to *Add Patient / Edit Patient Information* (p. 5-17) for more information.
[DELETE] or [DELETE ALL]	[DELETE] - Removes the selected procedure or procedures from the Patient List. [DELETE ALL] - Removes all completed and discontinued procedures from the Patient List. **NOTE:** [DELETE] or [DELETE ALL] does not remove procedures from the RIS or HIS. [DELETE] or [DELETE ALL] does not remove any exam images from the image database. Refer to *Delete Procedures* (p. 5-15) for more information.
[START EXAM] or [RESUME EXAM]	Starts, continues, or appends the selected procedure. The button name changes depending on the Scheduled Status of the selected procedure. If the selected procedure has a Status of "Suspended", the button name changes to [RESUME EXAM].
[EMERGENCY EXAM]	Begins an exam without selecting a procedure from the Patient List or adding the patient. The system will assign a unique tracking number as the Patient Name. Refer to *Chapter 6: Image Acquisition-Conduct an Emergency Exam* (p. 6-21) for more information. **NOTE:** The tracking number is the date and time the exam was initiated. The time is recorded to the second.

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Function	Description
[CASSETTE EXAM] 	Begins a cassette exam. Cassette exams allow exposures to be taken without any digital patient record or image storage.
Heat Units Remaining 	Shows the percentage of heat units remaining. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
system status 	Displays the last system status message. To clear the system status area, open the Message Log and close it again. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
[MESSAGE LOG] 	Brings up the message log since the last system re-start. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
[QAP] 	Brings up the screens that allow you to perform QAP. Refer to *Chapter 11: Quality Assurance and Maintenance* for more information.
[WARM TUBE] 	Brings up the tube warming status. Refer to *Chapter 9: General Information-Tube Warm Up* (p. 9-7) for more information.
[EXPOSE HOLD] 	Appears when there is some condition that prevents an x-ray from being taken, such as the exam room door being open or the tube is not in alignment with the detector. Click the button to view a list of all errors and interlocks that are preventing the exposure. The items are removed from the list as they are corrected. The button disappears when all errors and interlocks are corrected.
[iLinq] 	Connects to iLinq remote support services. Refer to *Chapter 9: General Information-iLinq* (p. 9-12) for more information.

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Patient List Columns

Table 5-2 describes the columns on the Worklist. This information comes from what has been entered in the Patient Information screen. Refer to *Add Patient / Edit Patient Information* (p. 5-17) for detailed descriptions of the information presented.

Table 5-2 Worklist columns

Column	Description
Date	The date the procedure is scheduled to occur. For locally added procedures, the date on which the procedure was added is the default.
Time	The time the procedure is scheduled to occur. For locally added procedures, the time at which the procedure was added is the default.
Patient Name	The full name of the patient as entered in Add Patient/Patient Information screen.
Patient ID	The patient's medical record number or any number that distinguishes the patient.
Accession #	The exam's accession number.
Physician	The name of the physician or technician who performed the exam. (This is the content of the Performing Physician field on the Add Information screen.)
Description	The procedure ordered for the accession number. (This is the content of the Procedure Description field on the Add Information screen.)
Modality	The modality of the procedure.

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Column	Description
Status	The status of the procedure. Available options are: • Scheduled – procedure has been created but not started • Completed – procedure has been closed • Suspended – procedure was suspended by the operator before completion • Discontinued – procedure was opened but cannot be completed • In Progress – the system was re-set during an active exam or the exam close process failed Refer to *Chapter 6: Image Acquisition-End Exam* (p. 6-22) for more information about Completed, Suspended, and Discontinued exams.

Re-size Columns

Columns in the patient list may be re-sized in order to reveal more information, such as seeing a patient's entire name.

1. Use the mouse to move the pointer to between two column headings.
   - The cursor changes from an arrow to a re-size indicator
2. Click and drag the re-size indicator left or right to increase or decrease the column width.
3. Release the mouse button when column is the correct width.
4. Repeat for any other columns you want to re-size.

Manage List / Find Procedures

The Worklist has several features that allow you to find patients and procedures quickly and to organize the list to your preferences.

Search, Filters, and Sorting allow you to control the display of the procedures in the Worklist.

Search

The Search feature finds procedures by column.

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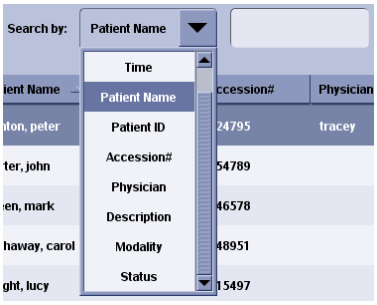
Figure 5-2 Search by column drop-down list



1. Click the button on the Search By drop-down list to select the column you want to search.
   - If the column you want is already selected, begin at step 3.
2. Select the column. For example, Patient Name.
   - The list is sorted by the selected column.
3. Type the search criteria into the text box.
   - The list automatically goes to the first procedure that matches the entered criteria.
   - If the list is long enough, it will scroll to the first item so that it appears at the top of the list.

NOTE: The text box is not case sensitive. That is, it does not matter if you used upper or lower case.

4. Continue typing the search criteria.
   - The list automatically selects the first procedure that matches what you have typed into the text box. This is called an incremental search.
   - If no procedures match what you have typed, the list de-selects all procedures and places the closest match at the top of the Worklist.

Sort by Column

Sorting allows you to organize the procedures by the column of your choice.

1. Click on the column heading you want to sort, or choose the column in the Search By drop-down list. For example, you want to see all the procedures that have a status of “Suspended”, so you click on the “Status” column heading.
   - An arrow appears in the column heading to indicate which column is currently being sorted.

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2. Click the column heading again to switch between ascending and descending order.
   - An up-pointing arrow indicates that the column is sorted in ascending order. That is, sorted in alphabetical order or numerical order from smallest to largest.
   - A down-pointing arrow indicates that the column is sorted in descending order. That is, sorted in reverse alphabetical order or numerical order from largest to smallest.

Figure 5-3 Column with descending sort

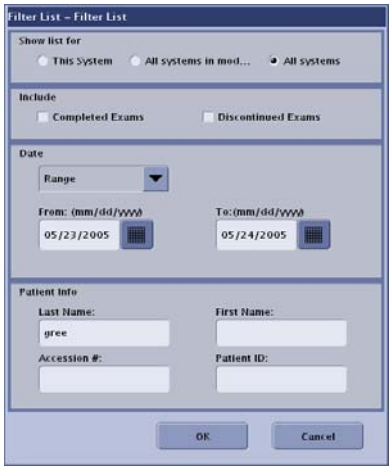
Filter List

Use filters to only display the items corresponding to your chosen criteria, e.g., exams taken only within a specified time period, patients whose last names begin with the letter 'J', or patient IDs beginning with the digits '547'.

Filters cannot be saved.

Clicking [REFRESH] will remove any filter that has been applied.

Figure 5-4 Worklist filter screen



The filter screen has several options for accepting or rejecting the information from the Worklist. Table 5-3 describes the filter screen functions.

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Table 5-3 Filter Functions

Function	Description
Show list for	Filters the Worklist items by system or modality. • This system – procedures entered locally on the unit • All systems in modality – procedures for all digital x-ray • All systems – procedures for all modalities
Include	Allows you to include or exclude completed or cancelled (discontinued) exams in the filter.
Date	Allows you to select the date of exams to filter by. • All – procedures scheduled for any date • Range - procedures scheduled for a specified range of time • Today – procedures scheduled for the current date
From (mm/dd/yyyy) To (mm/dd/yyyy)	When the "Range" option is selected for the date, allows you to enter dates or pick dates from a calendar screen.
Patient Information	Allows you to filter based on data from the Patient Information screen. Available options are: • Last Name • First Name • Accession # • Patient ID The filter may be restricted by any or all of these fields. Leaving a field blank means that it will not be included in the filter.
[OK]	Applies the filter and returns you to the results on the Worklist.
[CANCEL]	Clears the Filter screen and returns you to the Worklist.

Follow this process to filter the Worklist.

NOTE: The fields may be completed in any order.

1. Click [FILTER LIST] on the Worklist screen.
   - The Filter Screen appears

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2. Select the **Show list for** option.
3. Select the **Include** options.
4. Select the **Date** option.
5. If you selected **Range** for the Date option, enter or select the **From** and **To** dates.
   - The current date appears in both the **From** and **To** fields by default.

   To select dates from the calendar:

   a) Click the [CALENDAR] button.

Figure 5-5 Calendar button

   - The Filter calendar screen appears with the current date selected.

Figure 5-6 Filter calendar screen

   b) Click [◂] to select the previous month, if necessary.

   c) Click [▸] to select the next month, if necessary.

   d) Click a date to select it.

      – The calendar closes automatically when a date is clicked.

6. Enter any **Patient Information** you want to filter by.
   - You do not need to enter full words or numbers into these text boxes.
   - Entering more information into these text boxes will reduce the number of results.
   - Entering less or no information into these text boxes will increase the number of results.

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NOTE: The Patient Information text boxes **are** case sensitive.

7. Click [OK].
   - The Filter screen closes and the Worklist screen appears with only those procedures that met all of the filtering criteria (Figure 5-7).
   - If no procedures met all the criteria, the Worklist will be blank.
8. Click [REFRESH] to remove the filter.

Figure 5-7 Filtering results

Refresh

Some systems will automatically refresh the Worklist with data from the HIS/RIS on a regular basis (such as every 10 minutes). However, if your system does not automatically refresh—or you want to refresh the list before the scheduled time—you are able to refresh the list manually.

The Refresh feature also removes any filtering that has been applied. Refer to *Filter List* (p. 5-10) for more information.

Manual Refresh

Follow this procedure to manually refresh the Worklist.

1. Click [REFRESH] on the Worklist.
   - The Worklist updates with HIS/RIS data and removes any filtering.

NOTE: Refresh does not remove locally added procedures.

NOTE: You will not be able to make selections or access Worklist features while the Worklist is refreshing.

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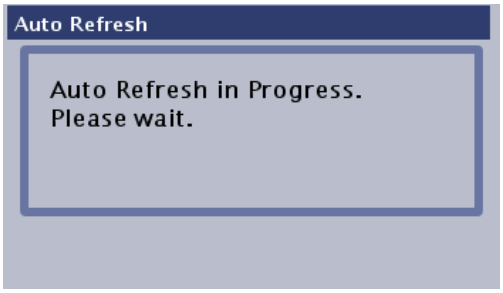
Auto Refresh

The Auto Refresh interval is set on the Preferences - Worklist screen in System Utilities. Refer to *Chapter 12: Set Preferences-Worklist* (p. 12-13) for more information.

When the system auto refreshes, a message (Figure 5-8) appears: "Auto Refresh in progress. Please wait." The message remains until the refresh process is complete.

NOTE: You will not be able to make selections or access Worklist functions while the Worklist is refreshing.

Figure 5-8 Auto refresh message



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Select Procedures

Use the following processes to select a patient from the Worklist. This process assumes the patient already exists on the system. If the patient is not on the Worklist, you must add the patient first. Refer to *Add Patient* (p. 5-21) for more information.

Select a Single Procedure

1. Close or suspend any open exams, if necessary.
   - The Worklist screen appears.
2. Select the procedure from the Worklist.
   - This can be done by clicking on the patient's name from the list or aiming the bar code scanner at the patient's bar code generated by the HIS/RIS system.
3. Refer to *Chapter 6: Image Acquisition* to conduct the exam.

Select Multiple Procedures

You may select multiple procedures for the same patient to begin image acquisition.

NOTE: The Patient Name, Patient ID #, and Exam Date must match exactly in order to be selected.

1. Sort the Worklist by Patient Name, if necessary.
2. Click on a procedure.
3. Click on another procedure for the same patient.
4. Continue clicking on procedures until all procedures for the patient are selected.
5. Click on any other procedure to deselect the procedures.

Delete Procedures

You may remove procedures from the Worklist individually or all completed, discontinued, and locally added procedures at once.

The [DELETE] button is able to switch between individual delete or delete all.

NOTE: Deleted procedures cannot be recovered or "undeleted."

To switch the button between "Delete" and "Delete All":

1. Click on the small arrow on the right side of the button.
   - A list appears with the available actions.

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Figure 5-9 Delete button options

2. Click the action you want to perform.
   - The system performs the action and the button name changes to the selection you made. The button will perform the selected action each time it is clicked until you change it.

NOTE: [DELETE] or [DELETE ALL] does not remove procedures from the RIS or HIS. [DELETE] or [DELETE ALL] does not remove any exam images from the image database.

Delete a Single Procedure

1. Select the procedure to delete.
2. Click [DELETE]. If necessary, switch the button to [DELETE].
   - A message appears: "The selected exam(s) will be deleted. Do you want to continue?"
3. Click [OK] to delete the procedures.
   - [CANCEL] retains the procedures and the Worklist appears.

Delete All Completed, Discontinued, and Local Procedures

1. Click [DELETE ALL]. If necessary, switch the button to [DELETE ALL].
   - A message appears: "All Completed, Discontinued, and locally scheduled exams will be deleted from this list. Any suspended exams will need to be individually deleted."
2. Click [OK] to delete the procedures.
   - The selected procedures are deleted and the Worklist appears.
   - [CANCEL] closes the message, retains the procedures, and takes you back to the Worklist.

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Delete Suspended Procedures

Suspended procedures cannot be deleted unless their status is changed to “Completed” or “Discontinued”

1. Select the suspended procedure to delete.
   - A message appears: “The patient entry you are trying to delete is still in progress. Would you like to mark the patient as ‘Completed’ / ‘Discontinued’ and proceed with deletion?”
2. Click [COMPLETE] or [DISCONTINUE].
   - [COMPLETE] changes the Status to of the procedures to “Completed.” If enabled, any acquired images are auto pushed, auto printed, and sent to PACS.
   - [DISCONTINUE] changes the Status to “Discontinued.” Any acquired images are marked as Discontinued and the information is sent to PACS.
   - [CANCEL] closes the message and returns you to the Worklist without deleting procedures.
   - The procedures are removed from the Worklist.

Add Patient / Edit Patient Information

Overview

The Add Patient (Figure 5-10) and Patient Information screens allow you to enter patient and procedure information before starting an exam or to view the information at any time.

NOTE: This screen may also be known as the Medical Procedure Card or MPC.

- To add a patient to the Worklist, click [ADD PATIENT] and enter or select the appropriate information. The information can be entered by two methods: manually or with a bar code scanner.

CAUTION: Make sure the patient’s name, ID number, birth date, and gender information are entered correctly.

NOTE: Use only standard alphanumeric characters to complete the screen. The use of a question mark (?), forward slash (/), etc., results in an illegal character error message.

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- To view the patient information from the Worklist or Image Management screens, select the exam then click [PATIENT INFORMATION]. Patient information is not editable when launched from the Image Management screen.
- To view the patient information from the Acquisition or Image Viewer screens, click [PATIENT INFORMATION]. Patient information is not editable when launched from these screens.

The screen appears on the same monitor where [PATIENT INFORMATION] was clicked.

Patient Information provided by the HIS/RIS is not editable.

Patient Information entered locally is editable until the exam is started. It is not editable after the exam is started or in progress.

NOTE: The Patient Information button is unavailable when multiple exams are selected at the same time.

Figure 5-10 Add Patient or Patient Information

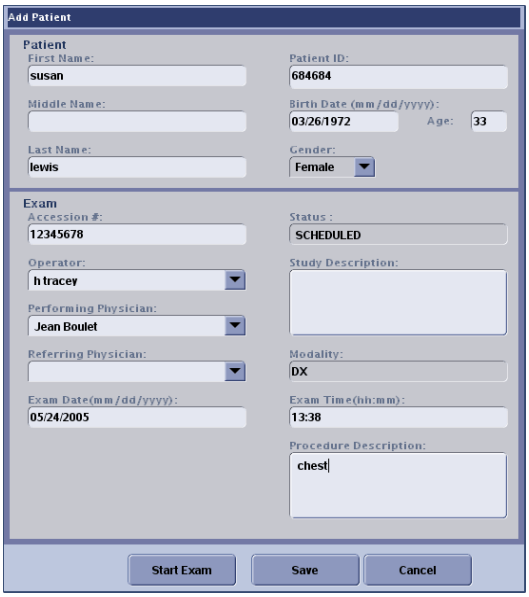

Table 5-4 Patient Information description

Function	Description
Patient	
First Name	Identifies the patient's first name.
Middle Name	Identifies the patient's middle name or initials.

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Function	Description
Last Name	Identifies the patient's last name. **NOTE:** Emergency Exams automatically fill this field with a system-generated identification, which is the word "NEW" followed by a date and time stamp of the second the [EMERGENCY EXAM] button was clicked. For example: NEW070422140345 shows that the exam was initiated in year 07, month 04, day 22, hour 14, minute 03, and second 45.
ID	Identifies the patient's medical record number or any number that distinguishes the patient. This number must be unique.
Birth Date	Identifies the patient's birthday in the format mm/dd/yyyy. If the date is not entered in the correct format, the screen will show the date field in red when [START EXAM] or [SAVE] is clicked. In the above example, the year was entered with only 2 digits ("45" instead of "1945").
Age	Identifies the patient's age. The field updates with the correct age when the Birth Date is entered.
Gender	Defines the sex of the patient. By default, "Other" is selected when the screen first opens.
Exam	
Accession Number	Identifies the exam's accession number.
Operator	Identifies the operator's name or initials. You can use the drop-down list to select commonly used names, or type the name into the drop-down list box. Refer to *Chapter 12: Set Preferences-Image Viewer* (p. 12-26) for information on adding names to the drop-down list.

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Function	Description
Performing Physician	Identifies the Radiologist or performing physician. You can use the drop-down list to select commonly used names, or type the name into the drop-down list box. Refer to *Chapter 12: Set Preferences-Image Viewer* (p. 12-26) for information on adding names to the drop-down list.
Referring Physician	Identifies the referring physician. You can use the drop-down list to select commonly used names, or type the name into the drop-down list box. Refer to *Chapter 12: Set Preferences-Image Viewer* (p. 12-26) for information on adding names to the drop-down list.
Status	Displays the status of the selected exam. When adding a patient, the only option is “Scheduled”. Patient Information status indicators are: • Scheduled – The procedure has been added to the Worklist, but the exam has not started. • Suspended – An exam was started but interrupted before completion. The exam may be resumed at a later time. • Complete - The exam is one that has been “Closed” on the Acquisition screen or marked as “Complete” by the Image Management screen when copying images. Completed exams are sent to the PACS (where available). • Discontinued – The procedure was opened, but no exposures were taken. The exam may be started at a later time or the procedure deleted. • Active – The exam is currently in progress
Procedure Description	Describes the procedure or series you are performing.
Exam Date	Sets the scheduled date of the selected exam. By default, the current date is automatically inserted. You may change this date as necessary.
Exam Time	Sets the time for the patient’s exam to be performed. By default, the time when the [ADD PATIENT] button was clicked is automatically inserted. You may change this time as necessary.
Modality	Displays the modality of the exam.

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Function	Description
[START EXAM]	Displays the Select Protocol screen in preparation for making exposures. Refer to *Chapter 6: Image Acquisition-Select or Change Protocols* (p. 6-12) for more information.This also adds the patient name to the Worklist. **NOTE:** This button does not appear if the Patient Information screen is opened from the Image Viewer or Image Management screens.
[SAVE]	Adds the patient to the Worklist or saves changes and closes the Add Patient/Patient Information screen. • If the Save button is selected but all of the data fields have not been filled in, a new patient is created anyway. • If no patient name has been entered, then the patient name will be listed as "New Patient". This allows you to start an exam quickly.
[CANCEL]	Erases all newly entered information and closes the Add Patient/Patient Information screen.

Add Patient

Use this procedure to enter the patient's information into your system.

1. Open the Worklist screen.
   - The Patient Worklist screen appears.
2. Click [ADD PATIENT].
   - The Add Patient screen appears.
3. Enter the patient information.
   - Data many be entered manually or with a bar code scanner. Refer to *Chapter 3: Hardware Overview-Acquisition Workstation* (p. 3-2) for more information.

CAUTION: Make sure the patient's name, ID number, birth date, and gender information are entered correctly.

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4. Click [SAVE] or [START EXAM].
   - Click [SAVE] to add the patient to the Worklist and return to the Worklist screen.
   - Click [START EXAM] (if available) to add the patient to the Worklist and begin Acquisition.
   - Click [CANCEL] to close the Add Patient screen without saving changes.

NOTE: For a new exam on a existing patient, the patient information cannot be edited.

Edit Patient Information

Patient information can only be edited before any procedure has been opened.

NOTE: You may only edit patient information for one procedure at a time. If multiple procedures are selected, the [PATIENT INFORMATION] button is disabled.

1. Select the procedure from the Worklist.
2. Click [PATIENT INFORMATION].
   - The Patient Information screen appears.
3. Edit the information as necessary.
4. Click [SAVE] to record the changes and return to the Worklist.
   - Clicking [CANCEL] closes the Patient Information screen without saving changes.

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Chapter 6
Image Acquisition

This section details the process of acquiring images using the digital detector or free cassette.

NOTE: This section covers conducting a basic exam.

- Refer to *Chapter 13: Advanced Applications and Options* for more information about Dual Energy and Image Pasting exams.
- Refer to *Appendix A: VolumeRAD™* for information about VolumeRAD exams.

Topics covered include:

- *Overview* (p. 6-1)
- *Patient Dose Reporting* (p. 6-10)
  - *Exceptions* (p. 6-10)
- *Re-start Completed or Discontinued Exams* (p. 6-11)
- *Resume Suspended Exams* (p. 6-12)
- *Select or Change Protocols* (p. 6-12)
  - *Automatic Protocol Recognition (APR)* (p. 6-14)
- *Conduct a Table Exam* (p. 6-15)
- *Conduct a Wall Stand Exam* (p. 6-17)
- *Conduct a Cassette Exam* (p. 6-20)
- *Conduct an Emergency Exam* (p. 6-21)
- *End Exam* (p. 6-22)
  - *Suspend* (p. 6-22)
  - *Close* (p. 6-23)
  - *Discontinue* (p. 6-23)

Overview

The Acquisition screen (Figure 6-1) is where the exam is set up and exposure details are adjusted. This screen appears when you click the [START EXAM], [EMERGENCY EXAM], or [CASSETTE EXAM] buttons on the Worklist or [START EXAM] from the Add Patient screen.

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NOTE: If you clicked the [CASSETTE EXAM] button, the Acquisition screen will present a limited set of options. Refer to *Conduct a Cassette Exam* (p. 6-20) for more information about cassette exams.

Figure 6-1 Acquisition screen (after AEC exposure)

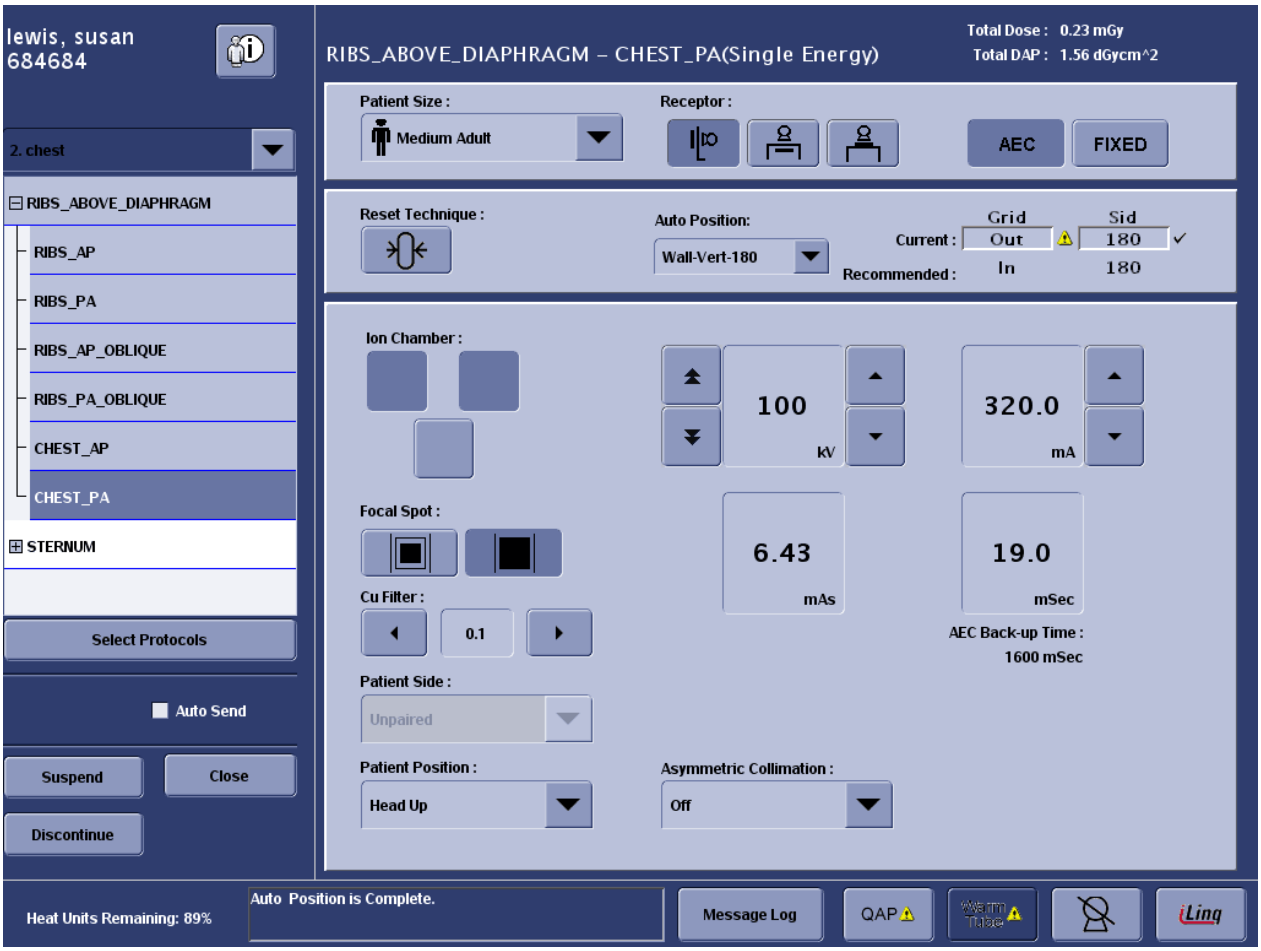

Table 6-1 Image Acquisition functions

Function	Description
patient identification lewis, susan 684684	Identifies the patient name and patient ID for the current procedure.

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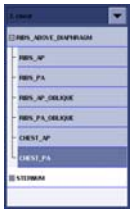
Function	Description
[PATIENT INFORMATION] 	Displays the Patient Information screen for the current procedure. Refer to *Chapter 5: Worklist-Add Patient / Edit Patient Information* (p. 5-17) for more information.
exam 	If multiple exams were selected from the Worklist, switches between exams for protocol selection, technique adjustment, and acquisition. This drop-down list does not appear if a single exam was selected or if the exam was initiated with the Emergency Exam or Cassette Exam buttons on the Worklist.
protocol list 	Lists the available views for the exam and shows which view is currently active.
[SELECT PROTOCOLS] 	Brings up the Select Protocols screen to add, remove, or change protocols. Refer to *Select or Change Protocols* (p. 6-12) for more information.
Auto Send 	If Auto Send is enabled, automatically sends acquired images to a pre-determined location on exam close. Refer to *Chapter 12: Set Preferences-Auto Send (Auto Push)* (p. 12-23) for more information.
[SUSPEND] 	Ends the exam with the intent of continuing at a later time. Does not initiate auto send or auto print, if enabled. Refer to *End Exam* (p. 6-22) for more information.
[CLOSE] 	Closes the procedure. If enabled, [CLOSE] sends billing information to the PACS system, auto sends, and auto prints acquired images. Refer to *End Exam* (p. 6-22) for more information.

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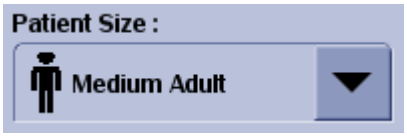
Function	Description
[DISCONTINUE] 	Ends the exam when the procedure has been opened but the exam cannot continue. Refer to *End Exam* (p. 6-22) for more information.
protocol name 	Identifies the currently selected protocol and view. Also identifies if the protocol is for a Single Energy, Dual Energy, or Image Pasting exam.
Total Dose: 	Displays the total entrance dose at the corresponding distance. Refer to *Patient Dose Reporting* (p. 6-10) for more information.
Total DAP: 	Displays the entrance dose estimate multiplied by the field-of-view area at the corresponding distance from receptor after an exposure is taken.
Patient Size: 	Allows you to choose the size of the patient being x-rayed. Available options are: • Small Pediatric (infants up to 1 year old) • Medium Pediatric (toddlers to 5 years old) • Large Pediatric (school-age children) • Small Adult • Medium Adult • Large Adult **NOTE:** Pediatric techniques are set at different system speeds then adult techniques. For example, the system speed for a pediatric exam of 70 kV at 32 mAs is 800. The default system speed for an adult exam of 70 kV at 32 mAs is 400.

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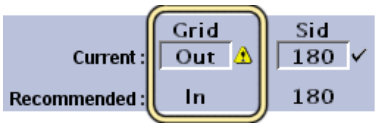
Function	Description
Receptor: 	Selects the receptor for the protocol. In order from left to right, the options are: • Wall stand • Table • Table Top (free cassette) **NOTE:** Some receptors may not be available for certain protocols. **NOTE:** For Table Top exams, the exposure time is limited to two (2) seconds.
[AEC] and [FIXED] (mode) 	Selects AEC or FIXED modes. Refer to *Chapter 4: Automatic Exposure Control (AEC)* for more information about AEC.
Reset Technique: 	Resets the technique to the default protocol settings.
Auto Position: 	If enabled, selects a pre-defined position for the x-ray tube. Pressing and holding the AUTO POSITIONING and POWER buttons on the RCIM initiates movement to the selected position. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more information.
Grid position 	Shows the current grid position, the recommended grid position for this technique. The alert icon indicates that the grid is not in the recommended position. A checkmark indicates that the current grid position matches the recommended position. **NOTE:** Exposure may not be inhibited if the current grid position is not the recommended position.

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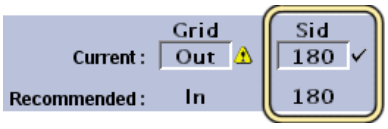
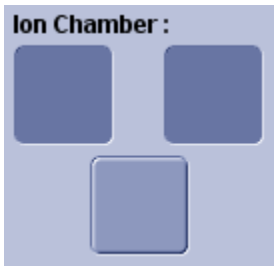
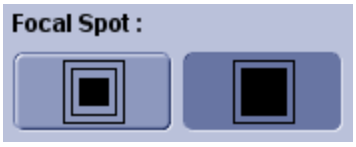
Function	Description
SID 	Shows the current SID, the recommended SID for this technique. The alert icon indicates that the SID is not at the recommended position. A checkmark indicates that the current SID matches the recommended SID. **NOTE:** Exposure may not be inhibited if the current SID is not the recommended SID.
Ion Chamber: (AEC mode only) 	If in AEC mode, selects the ions chambers to use. **NOTE:** When in AEC mode, at least one ion chamber must be selected. Any combination of chambers is allowed. **NOTE:** When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.
Focal Spot: 	Selects a large or small focal spot.
Cu Filter: 	Selects the amount of copper filtering. The selectable range is 0.0mm to 0.3mm with increments of 0.1mm.
Patient Side 	If conducting an exam on paired anatomy (for example, extremities), selects the side of the patient being x-rayed. Available options are: • Both • Left • Right If conducting an exam on unpaired anatomy, the control is disabled, as shown here.

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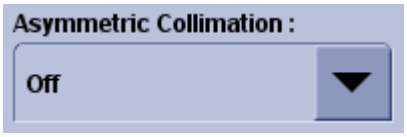
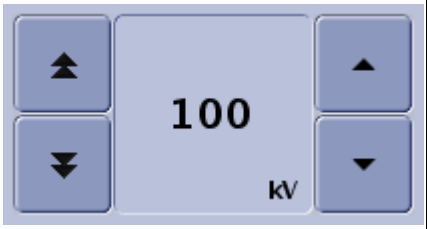
Function	Description
Patient Position: 	Selects the patient position relative to the detector. The available options change if the currently selected protocol view is for paired or non-paired anatomy. For paired anatomy, the available options are: • Digits to Head • Digits to Feet • Digits to Front • Digits to Back For unpaired anatomy, the available options are: • Head Up • Head Down **NOTE:** The above lists of positions for paired and unpaired anatomy are a general guidelines only. Some views have different options.
Asymmetric Collimation: 	Allows enabling and selection of Asymmetric Collimation for the wall stand receptor. Available options are: • Top • Bottom • Off **NOTE:** Asymmetric collimation is only available if the wall stand receptor is selected.
kV 	Adjusts the kV. • The up/down buttons on the right of the field adjust the kV by one unit. • The buttons on the left of the field adjust the kV by 10 units. The kVp selection range is 40-150, in 1 kVp increments.

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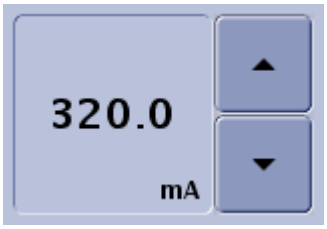
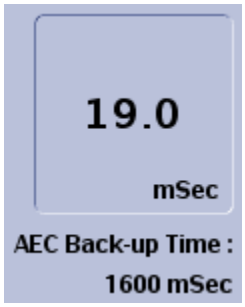
Function	Description
mA 	Adjusts the mA. The mA selection is in Renard steps. The available selections are: 10, 12.5, 16, 20, 25, 32,40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, 800, 1000 (1000 - 80 kW units only). **NOTE:** Not all mA and mAs selections are available at all kV settings.
mAs 	If in FIXED mode, adjusts the mAs. • The up/down buttons on the right of the field adjust the mA by one unit. • The buttons on the left of the field adjust the mA by 10 units. The mAs selection is in Renard steps. The available selections are: 0.25, 0.32, 0.50, 0.63, 0.8, 1.0, 1.25, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.3, 8.0, 10, 12.5, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, (mAs are less than 600 with AEC). **NOTE:** Not all mA and mAs selections are available at all kV settings. If in AEC mode, shows the calculated mAs for the current kV and mA after exposure.
mSec 	Shows the exposure time for the technique with the current kV, mA, and mAs settings. If in AEC mode, the AEC back-up time is displayed below the Sec field. The AEC default backup time is two (2) seconds.
Heat Units Remaining 	Shows the percentage of heat units remaining. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.

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Function	Description
system status 	Displays the last system status message. **NOTE:** To clear the system status area, open the Message Log and close it again. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information
[MESSAGE LOG] 	Displays the message log since the last system re-start. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
[QAP] 	Initiates the QAP process. When the yellow alert icon is present, indicates that QAP should be performed to ensure continued image quality. **NOTE:** QAP cannot be performed when images are being acquired or reviewed. End or close the exam before attempting to perform QAP. Refer to *Chapter 11: Quality Assurance and Maintenance* for more information.
[WARM TUBE] 	Displays the tube warming status. When the yellow alert icon is present, the tube must be warmed before images may be acquired. **NOTE:** Because the tube warming procedure produces x-rays, it cannot be performed when an exam is open. If the tube must be warmed before the exam can begin, suspend the exam (refer to *End Exam* (p. 6-22) for more information) and remove the patient and any others from the room before warming the tube. Refer to *Chapter 9: General Information-Tube Warm Up* (p. 9-7) for more information.
[EXPOSE HOLD] 	Appears when there is some condition that prevents an x-ray from being taken, such as the exam room door being open or the tube is not in alignment with the detector. Click the button to view a list of all errors and interlocks that are preventing the exposure. The items are removed from the list as they are corrected. The button disappears when all errors and interlocks are corrected.

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Function	Description
[iLinq]	Connects to iLinq remote support services. Refer to *Chapter 9: General Information-iLinq* (p. 9-12) for more information.

Patient Dose Reporting

In both Fixed and AEC exposure modes, estimates of patient dose are calculated after each acquisition and optionally displayed as part of image annotations. This information is also stored in the DICOM header of each image (the RAW image and its corresponding PROCESSED image) and cannot be edited or modified by the operator.

- Entrance Dose (unit: mGy) is an estimate of entrance dose (air-kerma) at a distance X in front of the wall stand cover or above the tabletop, depending on which receptor was used for acquisition. The default X is 25 cm (~ 10 in) but can be modified to site preference by service.

  Entrance dose is stored in DICOM header tag (0018,1405) in units of µGy.

- Dose Area Product or DAP (unit: dGy-cm2) is the entrance dose estimate multiplied by the field-of-view area at the corresponding distance from receptor.

  DAP is stored in DICOM header tag (0018,115e) in units of dGy-cm2.

NOTE: The patient dose estimates are accurately calculated using (1) current system and technique settings and (2) measured values collected during system install/ calibration. They are not actual per-image measurements of patient dose.

In manual override mode and Free Cassette mode, the SID displayed on the collimator is used to calculate the DAP.

Exceptions

- Non-DR (cassette, table-top, etc.) acquisition modes: The exact SID in this case is not known by the system and depends on patient positioning. A SID of 100 cm (40 in) is assumed for the purpose of estimating entrance dose.
- Dual Energy application: Dose estimates are not provided for Soft-Tissue and Bone images, since these images are not acquired but derived (created by image processing algorithms). Dose estimates are provided for the acquired (High-kVp and Low-kVp) images of a Dual Energy acquisition. Refer to *Chapter 13: Advanced Applications and Options-Dual Energy* (p. 13-2) for more information.

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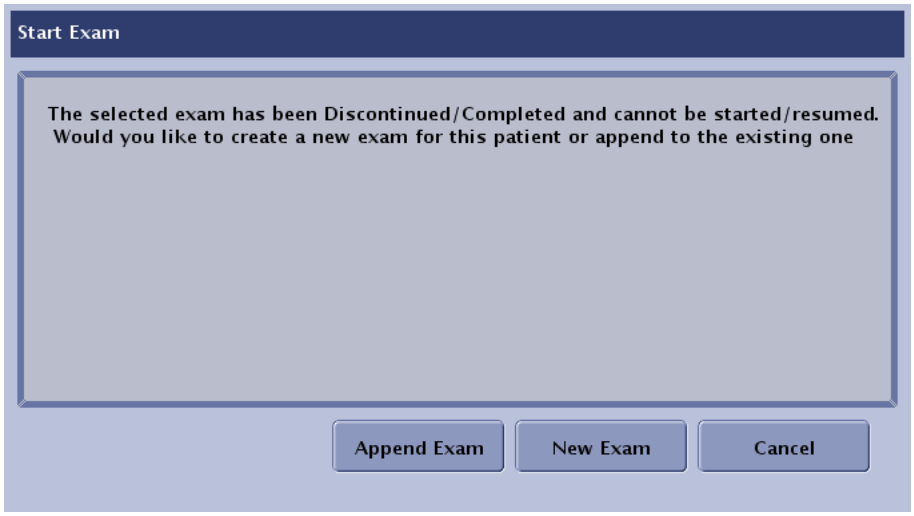
Re-start Completed or Discontinued Exams

Procedures with a Status of "Completed" or "Discontinued" cannot be re-opened. However, you may create a new exam or append the existing exam.

1. Select the procedure(s) from the Worklist.
2. Click [PATIENT INFORMATION] to verify the patient, if necessary.
3. Click [RESUME EXAM].
   - A message appears: "The selected exam has been Discontinued/Completed and cannot be started/resumed. Would you like to create a new exam for this patient or append to the existing exam?"

Figure 6-2 Start a discontinued or completed exam message


Start Exam
The selected exam has been Discontinued/Completed and cannot be started/resumed.
Would you like to create a new exam for this patient or append to the existing one
Append Exam
New Exam
Cancel

4. Click the button of the action to perform.
   - [APPEND EXAM] creates a new series within the existing exam and opens the Select Protocols screen.
   - [NEW EXAM] creates a new exam and series for the patient and opens the Select Protocols screen.

NOTE: The new exam will be placed under the same accession number as a new series. Check your facility's conformance standards before selecting this option because it may effect HIS/RIS or PACS formats.

   - [CANCEL] closes the message and returns you to the Worklist.
5. Refer to *Select or Change Protocols* (p. 6-12) to continue with the exam.

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Resume Suspended Exams

Suspended exams may be resumed at any time. The process of resuming a suspended exam is the same as starting a new exam.

1. Select the exams from the Worklist.
2. Click [RESUME EXAM].

NOTE: Protocol selections and technique changes are not saved in a suspended exam. Protocols must be reselected and techniques must be re-set.

Select or Change Protocols

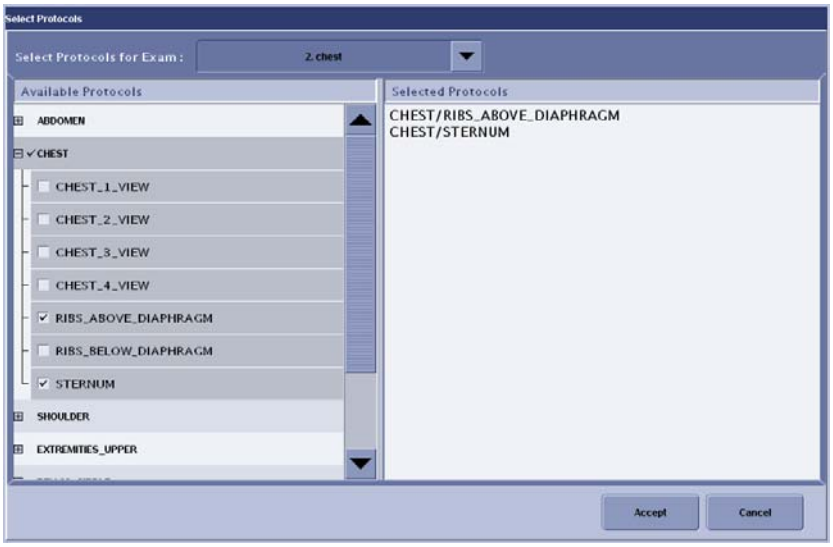
The Select Protocols screen (Figure 6-3) appears when you click [START EXAM] on the Worklist or Add Patient screen or when you click [SELECT PROTOCOLS] on the Acquisition screen.

The select protocols screen is divided into two halves: Available Protocols on the left and Selected Protocols on the right.

- Available Protocols lists all the protocols currently listed in the database, categorized by anatomical region: for example, head, chest, spine, and abdomen. Each category expands to show the exams for that category.
- Selected Protocols lists all currently selected protocols in the following format: anatomy / exam This list automatically updates as protocols are selected or removed.

Refer to *Chapter 12: Set Preferences-Protocols* (p. 12-42) for information on adding protocols to the protocol database.

Figure 6-3 Select Protocols



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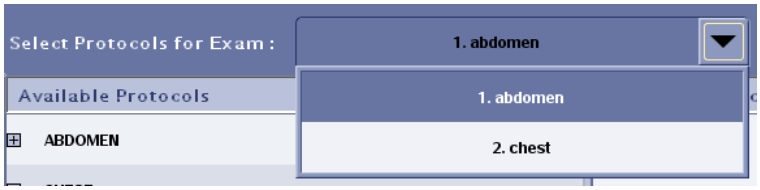
Use this process to select or change protocols for a procedure.

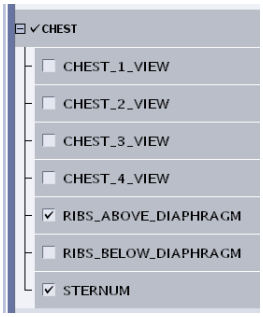
1. If multiple procedures were selected from the Worklist, select the procedure from the drop-down list.

Figure 6-4 Select procedure



2. Click on an anatomical category to open it.
   - The category expands to show the available exams.
   - Click on the anatomical category name again to close it.
3. Click on an exam to select it.
   - A checkmark appears in the box to the left of the exam name.
   - A checkmark appears next to the category name. This indicates that the category has at least one exam selected.

Figure 6-5 Selected exams



   - The category and exam names appear in the Selected Protocols list.
4. Click on the exam again to de-select it.
   - The category and exam name are removed from the Selected Protocols list.
5. Repeat process until all exams are selected for all procedures.
6. Click [ACCEPT].
   - The Select Protocols screen closes.
   - The Acquisition screen appears on the left monitor.
   - [CLOSE] removes the selections and returns you to the Worklist.
7. Refer to *Conduct a Table Exam* (p. 6-15) or *Conduct a Wall Stand Exam* (p. 6-17) to continue the exam.

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Automatic Protocol Recognition (APR)

Automatic Protocol Recognition (APR) is a purchased option that will eliminate the protocol selection process and take you directly to the Acquisition screen for the appropriate exam view after selecting the patient from the Worklist. This feature is designed to help provide better ease of use.

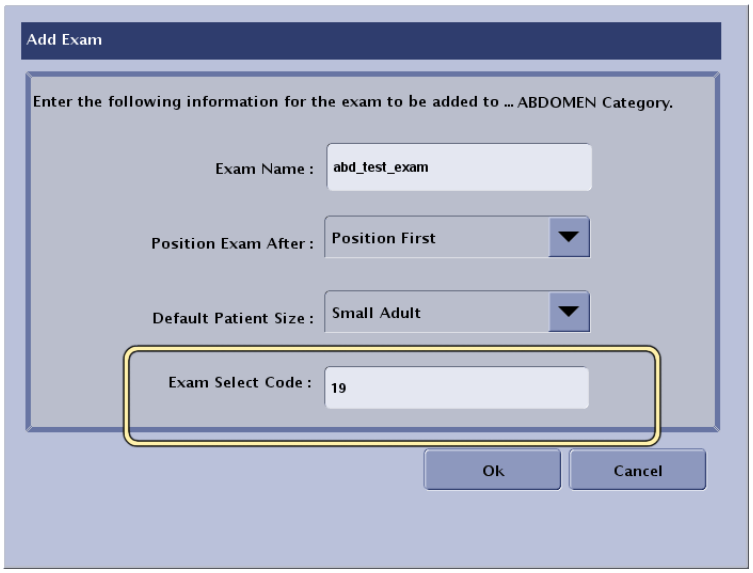
For APR to function, the system protocol database must have matching values for the Requested Procedure Code from the selected Exam in the HIS/RIS Worklist. The Acquisition screen will open with the first view of the first exam selected.

- If multiple SPS entries are selected at the same time, the error message will indicate which protocol codes received from the HIS/RIS did not match.
- If your system has APR enabled but you have manually added a patient or began an Emergency Exam, the following message will appear after you click the [START EXAM] button: "None of the protocol codes match with any of the existing protocols in the database. Please select them manually." Click the [OK] button to dismiss the message and proceed to select the protocols as previously described.

You are still able to change or select additional protocols from the Acquisition screen using the previously described process.

APR codes are added or edited through the **Exam Select Code** field on Add Exam or Edit Exam screen (Figure 6-6) of the Edit Protocol Database preferences. Refer to *Chapter 12: Set Preferences-Add or Edit Exam* (p. 12-46) for more information.

Figure 6-6 Add Exam screen



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Conduct a Table Exam

This section describes the adjustments required when conducting a table exam.

Refer to *Chapter 10: Quick Step Guides-General Acquisition* (p. 10-5) for an overview of the entire acquisition process.

Follow this process to conduct a table exam.

NOTE: If you need to interrupt the exam and resume it at a later time, click the [SUSPEND] button. You will be returned to the Worklist.

1. Select the Exam and View to perform from the protocol list.
2. Select the **Patient Size**. The system default is Medium Adult.

NOTE: To optimize processing for the best image quality, Patient Size should be confirmed for each view. Available options are:

- Small Pediatric (infants up to 1 year old)
- Medium Pediatric (toddlers to 5 years old)
- Large Pediatric (school-age children)
- Small Adult
- Medium Adult
- Large Adult

WARNING: It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

3. Select the Table **Receptor**, if necessary (Figure 6-7).

Figure 6-7 Receptors: Table receptor selected

4. Select [AEC] or [FIXED] mode (if applicable for the protocol).
5. Confirm or adjust the **Grid** and **SID** status.

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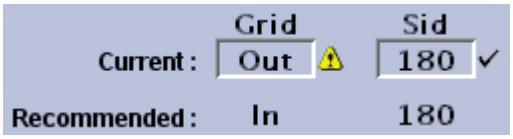
Figure 6-8 Grid and SID position



- An alert icon appears if the current Grid or SID is not in the recommended position for the technique.
- A checkmark appears if the current Grid or SID is in the recommended position for the technique.
- Figure 6-8 shows the Grid not in the recommended position and the SID in the recommended position.

NOTE: You may still be able to take exposures even if the grid or SID are not in the recommended positions.

6. Make technique adjustments as necessary: **kV**, **mA**, **Focal spot**, **Cu Filter**, and **Ion chambers** (AEC mode only).

NOTE: Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

7. Position the patient on the table.

NOTE: When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.

8. Confirm or adjust the **Patient Side** field, if applicable.
9. Confirm or adjust the **Patient Position** field.
10. If your system has auto positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING and POWER buttons on the RCIM until the tube stops moving. A message will appear in the Message Log area to confirm that the tube is in place. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more information.
11. Collimate and shield as appropriate for the exam.

WARNING: If using AEC mode, collimation must be active over the ion chambers being used. If it is not possible to collimate over the selected ion chambers, then FIXED mode must be used in order to prevent possible patient over-exposure.

12. Have the patient suspend respiration, if required.

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13. Make exposure using the hand-switch.
    - The image appears on Image Viewer screen (right monitor).

NOTE: On average, a preview image appears on the Image Viewer screen in less than 3 seconds after a single exposure, and the corresponding fully processed image appears in less than 9 seconds. A Dual Energy image set will take on average less than 15 seconds to appear on the Image Viewer screen after acquisition.

Conduct a Wall Stand Exam

This section describes the adjustments required when conducting a table exam.

Refer to *Chapter 10: Quick Step Guides-General Acquisition* (p. 10-5) for an overview of the entire acquisition process.

Follow this process to conduct a wall stand exam.

NOTE: If you need to interrupt the exam and resume it at a later time, click the [SUSPEND] button. You will be returned to the Worklist.

1. Select the Exam and View to perform from the protocol list.
2. Select the **Patient Size.** The system default is Medium Adult.

NOTE: To optimize processing for the best image quality, Patient Size should be confirmed for each view. Available options are:

- Small Pediatric (infants up to 1 year old)
- Medium Pediatric (toddlers to 5 years old)
- Large Pediatric (school-age children)
- Small Adult
- Medium Adult
- Large Adult

WARNING: It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

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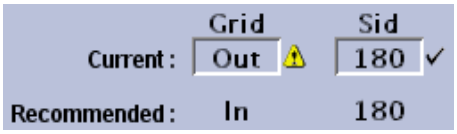
3. Select the wall stand **Receptor**, if necessary.

Figure 6-9 Receptors: Wall stand receptor selected

4. Select [AEC] or [FIXED] mode (if applicable for the protocol).
5. Confirm or adjust the **Grid** and **SID** status.

Figure 6-10 Grid and SID position



- An alert icon appears if the current Grid or SID is not in the recommended position for the technique.
- A checkmark appears if the current Grid or SID is in the recommended position for the technique.
- Figure 6-10 shows the Grid not in the recommended position and the SID in the recommended position.

NOTE: You may still be able to take exposures even if the grid or SID are not in the recommended positions.

6. Make technique adjustments as necessary: **kV**, **mA**, **Focal Spot**, **Cu Filter,** and **Ion Chambers** (AEC mode only).

NOTE: Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

7. Position the patient in front of the wall stand.

NOTE: When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.

NOTE: Some facilities may be equipped with a 4-cell ion chamber wall stand. Refer to *Chapter 3: Hardware Overview-4-cell Ion Chamber Option* (p. 3-28) for more information about how this affects ion chamber selection and patient positioning when used horizontally with a mobile table accessory.

8. Confirm or adjust the **Patient Side** field, if applicable.
9. Confirm or adjust the **Patient Position** field.
10. Confirm or adjust the **Asymmetric Collimation**, if applicable.

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11. If your system has auto positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING and POWER buttons on the RCIM until the tube stops moving. A message will appear in the Message Log area to confirm that the tube is in place. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more information.
12. Collimate and shield as appropriate for the exam.

WARNING: If using AEC mode, collimation must be active over the ion chambers being used. If it is not possible to collimate over the selected ion chambers, then FIXED mode must be used in order to prevent possible patient over-exposure.

13. Have the patient suspend respiration, if required.
14. Make exposure using the hand-switch.
    - The image appears on Image Viewer screen (right monitor).

NOTE: After the first exposure, a preview image appears in less than 5 seconds. It takes about 10 seconds for a fully processed image to appear on the Viewers screen. A Dual Energy exam will take approximately 15 seconds to appear on the Image Viewer screen.

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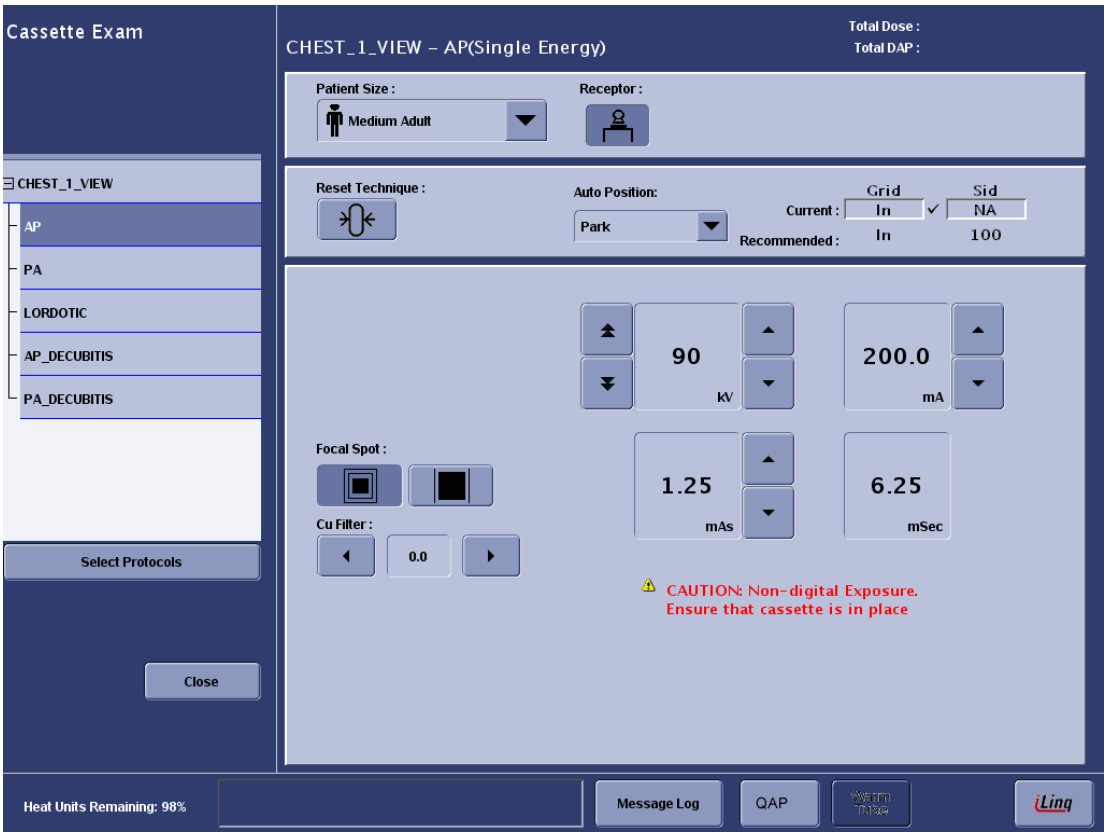
Conduct a Cassette Exam

The Cassette Exam function takes an x-ray without digital image acquisition and storage or electronic information sending and retrieval. This is for use with traditional Film Screen or CR cassette.

Figure 6-11 Cassette exam Acquisition screen



Follow this process to conduct a Cassette Exam.

1. Click [CASSETTE EXAM] from the bottom of the Worklist screen.

NOTE: Some views have Cassette as a **Receptor** selection.

NOTE: Because a cassette exam does not use digital image storage, selecting the procedure from the Worklist is not required.

Figure 6-12 [CASSETTE EXAM] button on Worklist

- The Select Protocols screen appears.

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2. Select the protocols to perform.
3. Click [ACCEPT].
   - The Acquisition screen appears in Cassette Exam mode.
4. Make manual technique adjustments as necessary for the appropriate body part being imaged: kV, mA, mAs, Focal Spot, and Cu Filter.
5. Position the patient with the cassette as appropriate for the exam.

NOTE: Auto Positioning, if enabled, is not available for cassette exams.

6. Collimate and shield as appropriate for the exam.
7. Have the patient suspend respiration, if required.
8. Make exposure using the hand-switch.
9. Process the cassette as necessary, depending on the media.
10. Click [CLOSE] to end the exam.
    - The Worklist appears.

Conduct an Emergency Exam

Emergency Exam is a function that allows a patient to be x-rayed without selecting the patient from the Worklist or adding the patient to the Worklist.

Figure 6-13 Emergency Exam button

Emergency Exam is used in the following situations:

- Medical emergency – The patient needs an x-ray taken immediately.
- No patient information available – There is no patient information to enter due to the patient's medical condition. For example, the patient was found unconscious with no identification.

When the [EMERGENCY EXAM] button is clicked, the system assigns a unique tracking number as the Patient Name. The tracking number is the word "NEW" followed by a date and time stamp of the second the Emergency Exam button was clicked. For example, "NEW050622140345" means that the exam was initiated in year 05, month 06, day 22, hour 14, minute 03, and second 45.

The tracking number is used as the Patient Name on image annotation and as the Patient ID.

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NOTE: When the patient information becomes available, images can be copied into the appropriate Worklist selection. The selection can be populated to the Worklist either by HIS/RIS or manual entry. Refer to *Chapter 8: Image Management-Copy Exams and Images* (p. 8-9) for more information.

Once initiated, an emergency exam is conducted the same way as any other exam.

Follow this process to conduct an emergency exam.

1. Click [EMERGENCY EXAM] from the bottom left of the Worklist.
   - The Select Protocols screen appears. Refer to *Select or Change Protocols* (p. 6-12) for more information.
2. Select the protocols for the exam.
3. Click [ACCEPT].
   - The Acquisition screen appears.
4. Select the protocol to perform from the Protocol List.
5. Acquire images. Refer to *Conduct a Table Exam* (p. 6-15), *Conduct a Wall Stand Exam* (p. 6-17), or *Chapter 10: Quick Step Guides-General Acquisition* (p. 10-5) for more information.

End Exam

There are several ways to end an exam: Suspend, Close, and Discontinue. Each method is used for a specific purpose to cover a variety of different situations.

Figure 6-14 Buttons used to end exams

Suspend

Suspend is for situations when you must leave the exam but intend to resume it at a later time. Suspending an exam does not initiate auto send or auto print functions (if enabled). Images acquired from a suspended exam do not appear on the Image Management screen. Any acquired images are stored in a temporary database until they are committed to the permanent storage database upon closure of the exam.

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Close

Close is used when the exam is complete; that is, you have acquired all images and do not intend to continue. If enabled, Close sends the images to PACS and initiates auto print and auto send functions. The images are committed to the permanent storage database and the exam appears on the Image Management screen.

Discontinue

Discontinue an exam when you have opened the procedure but cannot continue the exam. Any images that were acquired are marked so that they are not used by PACS.

When an exam is discontinued, you must provide the reason for discontinuing the exam. The system sends the status and reason together to the HIS/RIS.

The available reasons are:

- Doctor cancelled procedure
- Equipment failure
- Incorrect procedure ordered
- Patient allergic to media/contrast
- Patient died
- Patient refused to continue procedure
- Patient taken for treatment or surgery
- Patient did not arrive
- Patient pregnant
- Change of procedure for correct charging
- Duplicate order
- Nursing unit cancel
- Incorrect side ordered
- Discontinue for unspecified reason
- Incorrect worklist selection

NOTE: The reason for discontinuing an exam cannot be seen on the Worklist or Patient Information. The information is added to the DICOM header.

Use this procedure to discontinue an exam.

1. Click [DISCONTINUE] from the bottom of the Acquisition screen.
   - A message appears: “Please select a reason for discontinuing this exam.”
2. Select the option that best describes why the exam is being discontinued.
   - Choose “Discontinue for unspecified reason” if no other options describe the current situation.
3. Click [OK].
   - The message closes and the Worklist screen opens.
   - The status of the procedure changes to “Discontinued” on the Worklist.
   - If multiple procedures were selected, the discontinued status applies to all procedures that were open when the exam was discontinued.
   - Click [CANCEL] to close the message and return to the Acquisition screen.

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Chapter 7
Image Viewer

The Image Viewer screen (Figure 7-1) appears on the right monitor once an exposure is taken in a live exam or when an image series is chosen from the Image Management screen for review. This screen is where images are adjusted and viewed.

NOTE: This section covers the Viewer functions for Single Energy images.

- Refer to *Chapter 13: Advanced Applications and Options* for more information about Dual Energy and Image Pasting images.
- Refer to *Appendix A: VolumeRAD™* for more information about VolumeRAD.

Topics covered include:

- *Overview* (p. 7-2)
- *Tools and Controls* (p. 7-5)
- *Select Images* (p. 7-5)
- *Change Viewing Format and Size* (p. 7-6)
- *Adjust Images* (p. 7-7)
- *Annotate and Mask Images* (p. 7-9)
  - *Customize System Annotations* (p. 7-12)
  - *Add Image Annotations* (p. 7-13)
  - *Delete Image Annotations* (p. 7-15)
  - *Adjust Image Shutter (Crop Image)* (p. 7-16)
- *Re-process Images* (p. 7-18)
- *Determine Image Overexposure or Underexposure (DEI)* (p. 7-20)
  - *DEI Not Displayed* (p. 7-22)
  - *Corrective Actions* (p. 7-22)
- *Change Mouse Controls* (p. 7-23)
- *Apply Quality Check Mark* (p. 7-24)
- *Print Images* (p. 7-24)
  - *Auto Print* (p. 7-24)
  - *Manual Print* (p. 7-24)
    - ➢ *Print Multiple Images* (p. 7-25)
    - ➢ *Print Current Image* (p. 7-26)
- *Send Images* (p. 7-29)
- *Save Changes to Images* (p. 7-29)

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Overview

The left side of the screen contains all the image selection and adjustment tools. Most of the tools are categorized into 4 “palettes” that can be expanded or collapsed to reveal or hide different functions.

The majority of the screen (Figure 7-1) is devoted to image display. The images on the right side of the screen update as adjustments are made. You are able to view single or multiple images at once. When viewing multiple images, an aqua border identifies the currently selected image.

Table 7-1 describes the functions for the Image Viewer screen.

Figure 7-1 Image Viewer screen

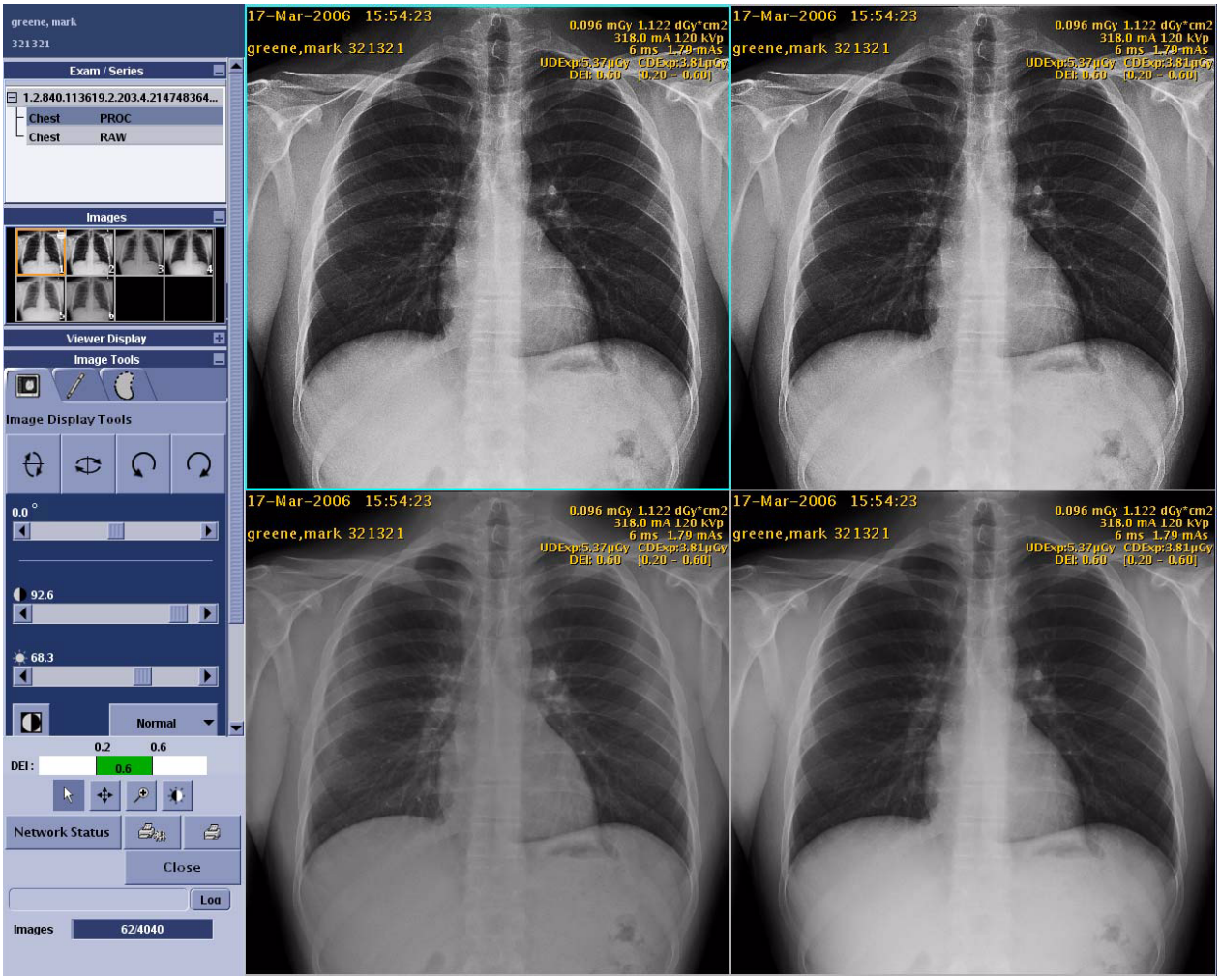

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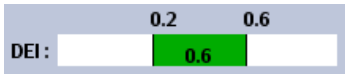
Table 7-1 Image Viewer screen functions

Function	Description
Patient Identification	Identifies the Patient Name and Patient ID as entered on the Patient Information screen.
Exam / Series	Collapsible palette that contains a list of exams and series within the exams. The Viewer shows all images in the study. All series within the study are listed and can be seen in the Viewer. Refer to *Select Images* (p. 7-5) for more information.
Images	Collapsible palette that shows small previews of all images in the selected series and highlights the currently selected image. Refer to *Select Images* (p. 7-5) for more information.
Viewer Display	Collapsible palette that allows you to adjust how many images are viewed at once and image size. Refer to *Change Viewing Format and Size* (p. 7-6) for more information.
Image Tools	Collapsible palette that contains tools to adjust images. Tools are divided by category into three tabs: • Image Display Tools – Refer to *Adjust Images* (p. 7-7) • Annotation – Refer to *Annotate and Mask Images* (p. 7-9) • Image Processing – Refer to *Re-process Images* (p. 7-18)
DEI (Detector Exposure Indicator) 	If enabled, displays the dose received by the detector and whether the dose is within an acceptable range for the anatomy. You may need to re-take images that show doses below the acceptable range. Refer to *Determine Image Overexposure or Underexposure (DEI)* (p. 7-20) for more information. **NOTE:** Depending on your system's configuration, the DEI may only show a numerical value. Refer to *Chapter 12: Set Preferences-DEI (Detector Exposure Indicator)* (p. 12-29) to configure the Detector Exposure Indicator.
mouse controls	Changes the action of the mouse when clicked and dragged on the image. Refer to *Change Mouse Controls* (p. 7-23) for more information.

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Function	Description
[NETWORK STATUS] 	Opens the Transfer Log screen to show status of printed and sent exams on the network. Refer to *Chapter 8: Image Management* for more information.
[FILM MANAGER] 	Allows manual print and configuration for multiple images. Refer to *Print Images* (p. 7-24) for more information.
[MANUAL PRINT] 	Allows setup and printing of the currently selected image. Refer to *Print Images* (p. 7-24) for more information.
[CLOSE] 	Closes the Image Viewer screen and prompts you to save any changes to images. Close also initiates auto print and auto push, if enabled. Refer to *Save Changes to Images* (p. 7-29) for more information.
system status 	Displays the last system status message. To clear the system status area, open the Message Log and close it again. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
[LOG] 	Brings up the message log since the last system re-start. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
database status 	Shows how many images are currently saved to the local database and approximately how many more images the database can accommodate.

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Tools and Controls

The following sections describe the tool palettes available on the left side of the Image Viewer screen.

Tool palettes may be expanded or collapsed by clicking the [+] or [-] buttons on the right side of the palette's title bar. If necessary, a scrollbar appears along the right edge of the tool palettes that allows you to scroll and see all the tools.

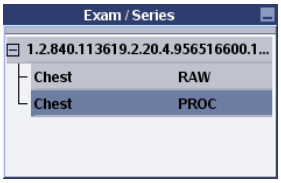
Figure 7-2 Tool palettes collapsed

Select Images

The Exam/Series palette (Figure 7-3) allows you to select which exam or series of images to view.

NOTE: When viewing or adjusting images from a completed exam, always work with processed images.

Figure 7-3 Exam/Series palette

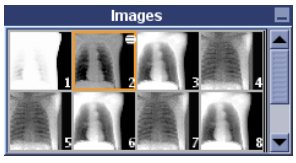


The Images palette (Figure 7-4) shows previews of all images in the selected series. The palette shows up to 8 image previews at a time. If there are more than 8 images in the series, a scrollbar appears on the right to allow you to see the rest of the images.

The image that is currently selected in the Image Viewer is shown with an orange border and a white dot in the upper right corner.

To view an image, click an image preview.

Figure 7-4 Images palette



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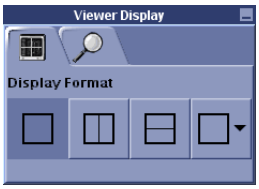
Change Viewing Format and Size

The Viewer Display palette controls how many images appear in the Viewer screen at one time and adjusts the magnification of each image.

The Display Format tab (Figure 7-5) buttons allow you to view up to 9 images at one time.

Figure 7-5 Viewer Display palette – Display Format tab



The Zoom tab (Figure 7-6) changes the size of the selected image when shown in the Viewer. Table 7-2 describes the Zoom options.

Figure 7-6 Viewer Display palette – Zoom tab

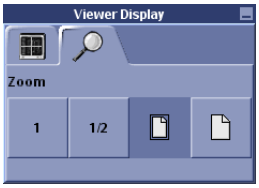


Table 7-2 Viewer Display palette – Zoom tab descriptions

Tool	Description
Zoom One	Shows default the image size where one pixel on the detector equals one pixel on the screen.
Zoom Half	Reduces the image to 50% (four pixels on the detector equals one pixel on screen).
Fit To Screen	Scales the image to fit within the Image Viewer screen.
True Size	Shows the image in the exact size it was acquired from the detector (one centimeter on the detector equals one centimeter on screen).

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Adjust Images

The Image Display Tools tab on the Image Tools palette (Figure 7-7) contains the tools to flip, rotate, adjust brightness, adjust contrast, invert, and apply windowing to the selected image. Table 7-3 describes each tool and how it functions.

Figure 7-7 Image Tools palette – Image Display Tools tab

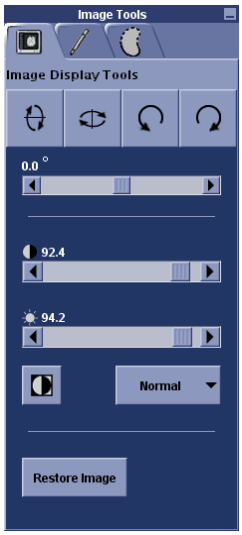

Table 7-3 Image Tools palette – Windowing and Geometric Operations tools description

Tool	Description
Vertical Flip	Flips the selected image 180 degrees on the horizontal axis; that is, switches top for bottom.
Horizontal Flip	Flips the selected image 180 degrees on the vertical axis; that is, switches left for right.
Rotate Left	Rotates the selected image counter-clockwise in 90 degree increments.
Rotate Right	Rotates the selected image clockwise in 90 degree increments.

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Tool	Description
Free Rotation 	Rotates the selected image both clockwise and counter-clockwise. The range is -180° to 180°. • Click the end buttons to rotate the image in 0.1 degree increments. • Click and drag the slider to spin the image. • Move the slider right to rotate the image clockwise. • Move the slider left to rotate the image counter-clockwise.
Contrast 	Adjusts the differences between dark and light on the selected image. • Move the slider right for more contrast (towards pure black and white). • Move the slider left for less contrast (towards uniform gray).
Brightness 	Lightens or darkens the selected image. • Move the slider right for a lighter image. • Move the slider left for a darker image.
Invert 	Reverses light and dark areas of the selected image. This function is a viewer display tool only. It is not DICOM supported for push to PACS or printers.
Windowing 	Applies windowing to the selected image. Available options are: • Normal – image as acquired • Hard – adjusts the image towards black and white • Soft – adjusts the image towards gray
Restore Image 	Removes all adjustments and returns the selected image to its original state.

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Annotate and Mask Images

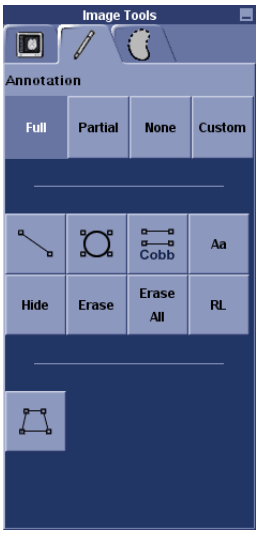
The Annotation tab on the Image Tools palette (Figure 7-8) contains the tools to annotate images. Table 7-4 describes the tools and their functions.

Image annotations are divided into two categories:

- System annotation – Information that is kept by the system, such as identifying information, exposure and acquisition information, and processing information. These annotations are displayed as text at the corners of the image. You may select which annotations appear, but you cannot control where the annotations are placed.
- Image annotation – Lines, ellipses, Cobb angle, user annotation (notes), and RL markers added by the operator to measure or bring attention to a section of the image. You draw or place these annotations on the image as appropriate.

Figure 7-8 Image Tools palette – Annotation tab

Standard, Dual Energy, and Image Pasting exams



VolumeRAD exams

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Table 7-4 Image Tools palette – Annotations tab tool descriptions

Tool	Description
Full	Places all available system annotation on the image. • Patient information – (top left corner) exam date and patient identification • Study information – (top left corner) exam identification • Series information – (top left corner) series identification • Image information – (top left corner) image identification • Acquisition information – (top right corner) dose and DAP • Hospital information – (top right corner) the name of the facility where the image was acquired • X-ray parameters – (top right corner) the mA, kVp, ms, and mAs of the exposure • Anatomy information – (bottom left corner) the protocol used to acquire the image • Processing information – (bottom left corner) the look used to process the image • User measurements – (bottom right corner) size and angle measurements for line, ellipse, and Cobb annotations • Display parameters – (bottom right corner) the size of the image and the zoom
Partial	Displays ONLY the facility name, dose information and technical factors.
None	Removes all system annotations from the image. System annotations can be re-applied by clicking [FULL], [PARTIAL], or [CUSTOM].
Custom	Brings up a screen (Figure 7-9) that allows you to choose which system annotations appear. Refer to *Customize System Annotations* (p. 7-12) for more information.

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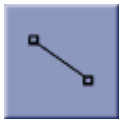
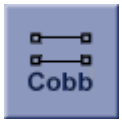
Tool	Description
Line 	Places a line on the image that you may re-size, move, or angle. Line specifications are shown in the User Measurements annotation at the bottom right corner of the viewer. Refer to *Add Image Annotations* (p. 7-13) for more information.
Ellipse	Places an ellipse (circle or oval) on the image that you may re-size, move, or re-shape. Ellipse specifications are shown in the User Measurements annotation at the bottom right corner of the viewer. Refer to *Add Image Annotations* (p. 7-13) for more information.
Cobb 	Places a Cobb angle (two lines) on the image that you may re-size, move, or angle. Cobb angle specifications are shown in the User Measurements annotation at the bottom right corner of the viewer. Refer to *Add Image Annotations* (p. 7-13) for more information.
User Annotation	Places a text box on the image that you may add notes into. Refer to *Add Image Annotations* (p. 7-13) for more information.
Hide and Show	Temporarily removes image annotations from the image. Click [SHOW] to see the annotations.
Erase	Deletes the selected image annotation. **NOTE:** Deleted annotations cannot be recovered.
Erase All	Deletes all image annotations. **NOTE:** Deleted annotations cannot be recovered.

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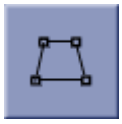
Tool	Description
RL	Places a Right or Left marker on the image for reference. **NOTE:** RL markers are only available when the image is open in a live exam or for re-processed images. Refer to *Add Image Annotations* (p. 7-13) for more information.
Apply to slices	This button only appears for images acquired during a VolumeRAD exam. Allows you to copy the annotations to all slices in the series. Refer to *Appendix A: VolumeRAD™* for more information about VolumeRAD.
Quality Control Tags	This button only appears for images acquired during a VolumeRAD exam. Allows you to apply the quality control mark to all slices in the series. Refer to *Apply Quality Check Mark* (p. 7-24) for more information about the quality mark. Refer to *Appendix A: VolumeRAD™* for more information about VolumeRAD.
Manual Shutter 	Manually adjusts the image shutter. In some cases, the FOV detected by the system does not match the actual exposed FOV. Use the Manual Shutter tool to correct this. **NOTE:** This function is only available when the image is open in a live exam or for re-processed images. Refer to *Adjust Image Shutter (Crop Image)* (p. 7-16) for more information.

Customize System Annotations

Follow this process to customize the system annotations that appear on the image.

1. Open the Image Tools palette and click the Annotations tab, if necessary.
2. Click [CUSTOM].
   - The Annotation screen (Figure 7-9) appears.

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Figure 7-9 Custom Annotation selections

3. Select (check) the annotations you want to appear.
4. Adjust the Font Size, if necessary.
   - The available font sizes are:
     - -3 (smallest)
     - -2
     - -1
     - N (normal)
     - +1
     - +2
     - +3 (largest)
5. Click [OK].
   - [CANCEL] closes the screen and leaves the selections unchanged.

Add Image Annotations

NOTE: All image annotations initially appear in the same place (center of image) and are the same shape, size, and/or angle. It is possible to have multiple annotations of the same kind stacked on top of each other.

Follow this process to add image annotations.

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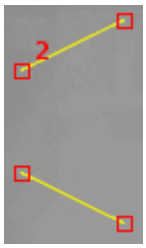
1. Select the image to annotate, if necessary.
2. Click the button of the annotation to insert.

NOTE: Selected image annotations are yellow with red handles. Unselected image annotations are aqua without handles.

3. Move, re-size, or change the angle of the annotation as described in Table 7-5.

Table 7-5 Image annotation instructions

Annotation	Instructions
Line	Select the line. • To move: Click and drag the middle of the line. • To change the angle or to resize: Click and drag one of the square handles at the ends of the line.
Ellipse	Select the ellipse. • To move: Click and drag the ellipse by its edge (not on a square handle or + handle). • To change shape or re-size: Click and drag a square handle. • To rotate: Click and drag a + handle.
Cobb 	Select the Cobb. • To move: Click and drag the middle of a line. • To change the angle or to resize: Click and drag one of the square handles at the end of a line.

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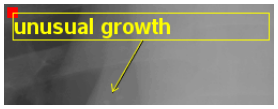
Annotation	Instructions
User Annotation 	Select User Annotation from the Image Tools palette. Select an annotation from the list or click in the "CUSTOM" text area of the Text Annotation screen. Type your comment. Click [OK]. • To move: Press and drag by the red square on the top left corner of the text box. • To edit: Double-click the User Annotation. Make your changes on the Text Annotation screen. Refer to *Chapter 12: Set Preferences-Pre-set Annotations* (p. 12-27) for more information about configuring the pre-set annotation list.
RL Marker 	Select the RL marker. • To move: Select the Marker and drag to the desired area. • To switch between R and L: Click the [RL] button. **NOTE:** Only one RL marker is inserted per image.

Delete Image Annotations

Follow this process to remove image annotations.

NOTE: It is not possible to recover deleted annotations.

1. Select the annotation.
2. Click [ERASE] or [ERASE ALL].
   - If [ERASE ALL] was clicked, a message appears: "Would you like to remove all annotations from the selected image?"
3. Click [YES].
   - All annotations are removed.

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NOTE: The process to remove image annotations from VolumeRAD images is different from other acquisition types. Refer to *Appendix A: VolumeRAD™* for more information.

Adjust Image Shutter (Crop Image)

The system has the ability to detect the collimated edges of the image and may apply shutters to mask the collimated areas. Refer to *Automatic Shutter* (p. 7-18) for more information.

The Manual Shutter function allows you adjust the automatically applied (default) shutter for viewing and printing.

You can only adjust the shutter of images in an active exam or of re-processed images.

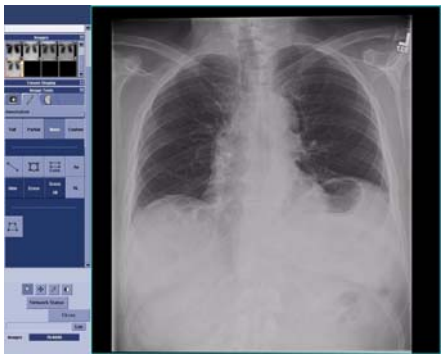
NOTE: To view hidden areas of the image, use the Manual Shutter and drag the red corner handles to the edges of the image.

NOTE: The Manual Shutter is not available for images acquired during a VolumeRAD exam. Refer to *Appendix A: VolumeRAD™* for more information.

Follow this process to adjust the shutter of an image.

1. Select the image.

Figure 7-10 Image before adjusting shutter



2. Click [MANUAL SHUTTER].
   - The image will be shown in reduced size so that you are able to see the edges (Figure 7-11).
   - The shutter appears as a yellow box with red handles (Figure 7-12). Anything outside of the box will be blacked out when the shutter is applied.

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Figure 7-11 Editing the manual shutter

Figure 7-12 Close up of manual shutter

3. Click and drag the red corner handles to the desired shape and size.

NOTE: Any image annotations (line, Cobb, ellipse, R/L marker) that are outside of the visible image area will be lost when the exam is closed. Make sure that annotations are within the active image area. Manual shutters do not affect system annotations.

4. Click [MANUAL SHUTTER] to apply the adjustment.

   - If the image does not return to its selected size, click the Zoom buttons on the Viewer Display palette to re-select the viewing size. Refer to *Change Viewing Format and Size* (p. 7-6) for more information.

Figure 7-13 Image after adjusting shutter

5. Click [MANUAL SHUTTER] again to edit.

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Automatic Shutter

All images are automatically shuttered. For images acquired with a rotated collimator (or in Manual Override mode), the Intelligent Collimator Edge Detection (ICED) algorithm relies solely on image information in order to locate any collimation edges present in an x-ray radiograph. This allows the system to provide a shuttered image on the viewer regardless of where the collimated image edges lie on the detector.

In the event of incorrect automatic shuttering, the image can be recovered by manually re-shuttering the image to visualize the desired anatomy and then re-processing with the same look.

Re-process Images

Image re-processing allows the system to extract more information from an already acquired image by changing the processing settings instead of taking additional exposures.

Re-processing can be performed on any image that has a corresponding raw data set. Images can be re-processed both in live exams and in review mode.

Re-processing creates a new image in the PROCESSED series.

NOTE: When closing an exam or closing patient in review mode, you must select to save changes to images or the re-processed images will not remain in the series. Refer to *Save Changes to Images* (p. 7-29) for more information.

The initial image processing is determined by the default that is configured for the protocol. Refer to *Chapter 12: Set Preferences-Image Processing* (p. 12-32) for more information.

Table 7-6 describes the settings used to re-process an image.

NOTE: Refer to *Appendix A: VolumeRAD™-Reprocess Images (Adjust Slices)* for information about re-processing images from a VolumeRAD series.

Figure 7-14 Image Tools palette – Image Processing tab

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Table 7-6 Image Tools palette – Image Processing tab descriptions

Function	Description
Current	Shows the current image processing settings.
Anatomy	Changes the anatomical region.
View	Changes the anatomy view. For example, antero-posterior
Image Type	Displays the image type of the acquisition. Images cannot be re-processed with a different image type than originally acquired.
Patient size	Changes the patient size. For example, large adult, small pediatric, etc.
Look	Changes the processing look. Looks are the way an image is processed to be viewed by a radiologist for interpretation. Looks are pre-defined combinations of brightness, contrast, edge enhancement, and tissue equalization. Factory Look descriptions: • Factory Look 1 – similar to analog film, low edge, no TE • Factory Look 2 – low CR look, low edge, moderate tissue contrast • Factory Look 3 – moderate CR look, low edge, TE • Factory Look 4 – highly digital look, high edge, high TE • Custom looks – The system allows the user to build up to 5 custom looks in any combination of parameters. Refer to *Chapter 12: Set Preferences-Image Processing* (p. 12-32) for more information about building custom looks.
[REPROCESS] 	Applies the changes and re-processes the image. Re-processing creates a new image in the series. **NOTE:** The button does not become enabled until the Look is selected.
[EDIT PROC] 	Brings up a screen that allows you to view the Factory look settings or create custom looks. Refer to *Chapter 12: Set Preferences-Image Processing* (p. 12-32) for more information about building custom looks.

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Function	Description
[DE RESTORE] 	Recovers Dual Energy processing. That is, sends the raw data through Dual Energy processing again. That is, it creates a soft tissue and bone image. The button is disabled if the image was acquired with a single energy or Image Pasting (if enabled) protocol.
[REPASTE] 	If enabled, opens a screen to allow manual alignment of Image Pasting acquisitions. Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more information.

Determine Image Overexposure or Underexposure (DEI)

The Detector Exposure Index (DEI) provides a visual indicator to the user for the amount of exposure received by the detector for a given image. It is designed as a tool for the user to be able to obtain a properly exposed image by altering acquisition parameters in the event of a retake. DEI estimates the dose that has reached the detector and compares it to the expected dose for the anatomy to indicate if the image is under- or over-exposed.

With film cassettes, exposure is directly related to the resulting image; films that are under-exposed or over-exposed will be either too light or too dark. With the DR Detector, dynamic range detection algorithms compensate for exposure errors to create images with acceptable brightness and contrast. Because there is no visible relationship between the actual exposure and the image quality, DEI is used to identify and track under- and over-exposure.

The DEI acceptable range varies by anatomy. For example, a chest PA exposure may result in a DEI of 0.6 while a hand exposure may result in a DEI value of 1.0. The upper and lower DEI limits can be adjusted for each anatomical view through the Preferences screen.

DEI may be configured to show a visual range display (Figure 7-16), to show a numerical display (Figure 7-15), or to not be shown at all.

Refer to *Chapter 12: Set Preferences-DEI (Detector Exposure Indicator)* (p. 12-29) for more information about adjusting the upper and lower DEI limits and about configuring the DEI display.

Figure 7-15 Example of a numerical DEI display

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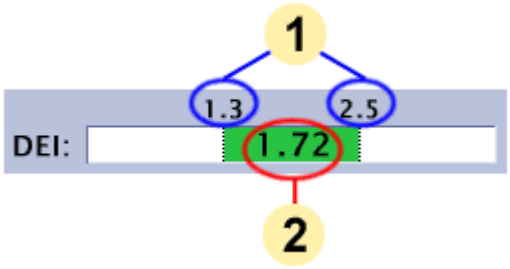
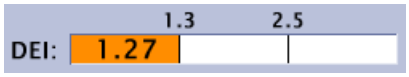
Figure 7-16 DEI visual range display



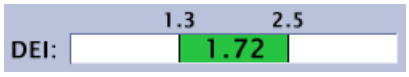
1. Acceptable DEI range (upper and lower limit)

2. Current DEI for the selected image

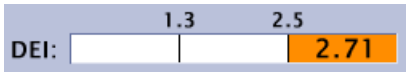
Figure 7-17 Examples of visual range DEI displays



First segment (left) colored orange
Low DEI = Image under-exposed



Center segment colored green
Acceptable DEI = Image correctly exposed



Last segment (right) colored orange
High DEI = Image over-exposed

For each acquired image, the system provides 3 estimated values:

- Uncompensated Detector Exposure (UDExp): Estimated exposure (µGy) to the detector behind the patient anatomy with an assumed a technique of 80 kV with no anti-scatter grid. This information is stored in the DICOM header.
- Compensated Detector Exposure (CDExp): Estimated exposure (µGy) to the detector behind the patient anatomy with the actual kV and use of anti-scatter grid. This information is stored in the DICOM header.
- Detector Exposure Index (DEI): A relative measure of exposure to the detector, as compared to the expected exposure for a particular anatomical view. It is a visual indicator on the viewer display.

DEI compensates for the speed setting of the system. For example, if an exposure is taken of an object at a speed setting of 400 and the resultant DEI was 1.72, then an exposure taken of the same object (assuming identical technique and positioning) after setting the speed to 200 will also give a DEI of 1.72.

NOTE: A higher DEI indicates a higher exposure to the detector. It should not be confused with system "speed" which decreases as the exposure increases.

Default DEI lower and upper limits are provided as preliminary guidelines. These guidelines should not be taken as strict requirements of retakes/re-exposures. DEI read-outs are reference guides to help the technologist determine that if a re-acquisition of an image is necessary, the indicator can help the user determine appropriate technique adjustments to provide adequate exposure to the detector.

The specific limits and retake rules should be ultimately determined by the appropriate staff at your facility.

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DEI Not Displayed

The DEI will not be displayed in the following situations:

- Dual Energy images (if DE is enabled)
- Image Pasting composite images and sub-images (if Image Pasting is enabled) Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more information. For sub-images, the DEI will be shown in image annotation.
- VolumeRAD slices (if VolumeRAD is enabled). Refer to *Appendix A: VolumeRAD™* for more information.

Corrective Actions

Do the following if **both** the DEI indicator is out of the acceptable range and the image quality is poor:

- Low DEI - increase the mAs and kV values.
- High DEI - decrease the mAs and kV values.

If DEI is within the acceptable range but the image quality is still poor, the image may need adjustment through looks customization. Refer to *Re-process Images* (p. 7-18) to correct individual images or *Chapter 12: Set Preferences-Image Processing* (p. 12-32) to change the default processing for exams and views.

NOTE: Call for service if the system continues to show low or high DEI. Recurring DEI errors may indicate that the system needs calibration or repair.

Exceptions to Corrective Actions

The following conditions may achieve a properly exposed image but still result in a low DEI. These should be treated as special cases and the standard retake and corrective action rules may not apply.

- The presence of external patient shielding (i.e., lead apron) in the field of view can result in an unexpectedly low DEI (and UDExp/CDExp). The presence of shielding can be easily confirmed by viewing the image.
- The incorrect determination of the FOV by the system can result in an unexpectedly low DEI (and UDExp/CDExp). The presence of significant collimation regions in the final image can be easily confirmed by viewing the image. Correct the FOV using the Manual Shutter and re-process the image to get a better DEI estimate.

NOTE: User must select the appropriate FOV for the anatomy imaged, and use proper collimation at all times.

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Change Mouse Controls

The mouse control buttons (Figure 7-18) change the action of the mouse when it is clicked and dragged on an image.

Figure 7-18 Mouse control buttons

The mouse controls allow you to perform other functions that are not available in any other tool palette.

Follow this process to change the mouse controls. Table 7-7 describes the action of each control.

1. Select the image to act upon, if necessary.
2. Click the mouse control to use.
3. Click and drag the mouse on the selected image.

Table 7-7 Mouse Control description

Tool	Description
Select Image	When viewing multiple images, selects the image to act upon. This is the default mouse behavior.
Pan Image	Moves the image within the viewing area.
Image Magnifying Glass	Shows a small part of the image at 3 times magnification.
Change Image Brightness / Contrast	Changes the brightness and contrast by dragging the mouse pointer instead of using the Image Tools controls. • Contrast: Click and drag the mouse vertically. Up is more contrast, down is less contrast. • Brightness: Click and drag the mouse horizontally. Right is brighter, left is darker. Clicking and dragging the mouse diagonally will change both brightness and contrast in proportion to the angle of movement. That is, if you move the mouse at a perfect 45° angle, brightness and contrast will change equally; however, if you move the mouse at a 20° angle (more horizontally) the brightness will change more than the contrast.

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Apply Quality Check Mark

If Auto Tag is enabled (refer to *Chapter 12: Set Preferences-Image Management* (p. 12-17) for more information), quality check indicates that an image is of acceptable quality and allows the image to be auto printed and auto pushed (if enabled).

The quality check indicator is a "T" that appears in a white box at the bottom right corner of the image (Figure 7-19). The quality check indicator is on by default. Removing the indicator means that the image is not acceptable and will not be auto printed or auto pushed and will remain on the local database only.

NOTE: The quality check indicator is only available in live exams.

To remove the quality check indicator, double-click the white box so that the "T" disappears.

To restore the quality check indicator, double-click the white box so that the "T" reappears.

Figure 7-19 Quality check indicator

Print Images

Images can be printed from the system in two ways: Manual Print and Auto Print.

Auto Print

The system can be configured to perform an automatic print upon closure of the exam. Preferences are accessed from the Utilities screen. Refer to *Chapter 12: Set Preferences-Image Management* (p. 12-17) for information on configuring Auto Print.

Manual Print

Film Manager and Manual Print allow you to print images on demand.

- Film Manager allows configuration and printing of multiple images in a series.
- Manual Print allows configuration and printing of the currently selected image.

The manual print buttons are near the bottom of the tools area, under the mouse controls buttons, as shown in Figure 7-20.

Figure 7-20 Manual print buttons – Film Manager and Manual Print

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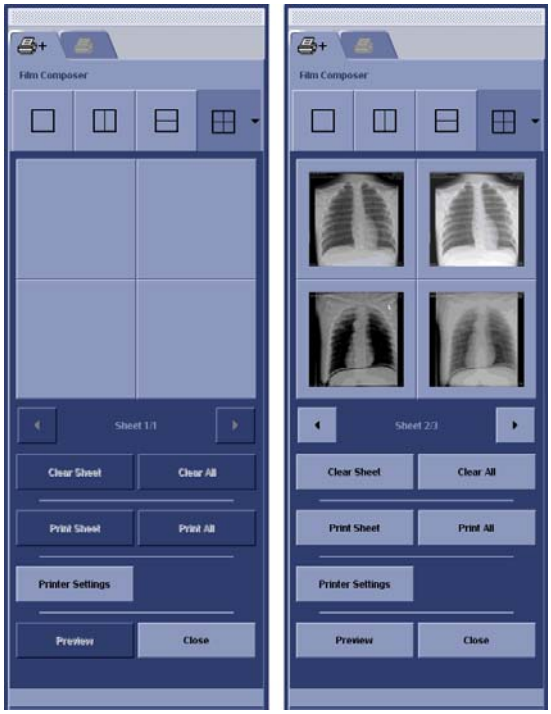
Print Multiple Images

Follow this process to print multiple images.

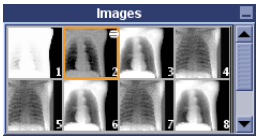
1. Click [FILM MANGER].
   - The Film Composer screen (Figure 7-21) appears.

Figure 7-21 Film Composer screen - before and after images are added



2. Select the number of images you want to appear on a sheet.
   - If there are more images in the series than will fit on the sheet, use the Sheet [◂] and [▸] buttons to configure the printing options for each sheet.
   - You are able to change the number of images for each sheet individually; however, changing the format will remove any images that already exist on the sheet.
3. Use the mouse to click and drag the image thumbnails from the Images palette (Figure 7-22) to the Film Composer screen.

Figure 7-22 Images palette



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4. Use the buttons to confirm and adjust the print settings.
   - Click [PREVIEW] to see how the images are positioned on the sheet.
   - Click [CLEAR SHEET] to remove images from the currently displayed sheet.
   - Click [CLEAR ALL] to remove images from all sheets.
   - Click [PRINT SHEET] to print the currently displayed sheet.
   - Click [PRINT ALL] to print all sheets.
5. Click [PRINTER SETTINGS] to confirm or adjust the printer configuration. (Refer to Figure 7-24 and Table 7-8 for more information.)
6. Click [CLOSE] when finished.

Print Current Image

Follow this process to print a single image.

1. Select the image from the Images tool palette, if necessary.
2. Click [MANUAL PRINT].
   - The Print Images screen appears.
3. Adjust the settings as indicated in Table 7-8.
4. Click [PREVIEW] to confirm that the image placement is correct.
   - If the image placement is incorrect (as shown in Figure 7-23), click [CANCEL] to return to the Print Images screen and adjust the settings.
   - If the image placement is acceptable, click [PRINT] to print the image.

Figure 7-23 Example of Print Preview with incorrect settings

5. Click [PRINT] to print the image.
   - [CANCEL] closes the Print Images screen without printing and returns you to the Image Viewer screen.

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Figure 7-24 Print Images screen

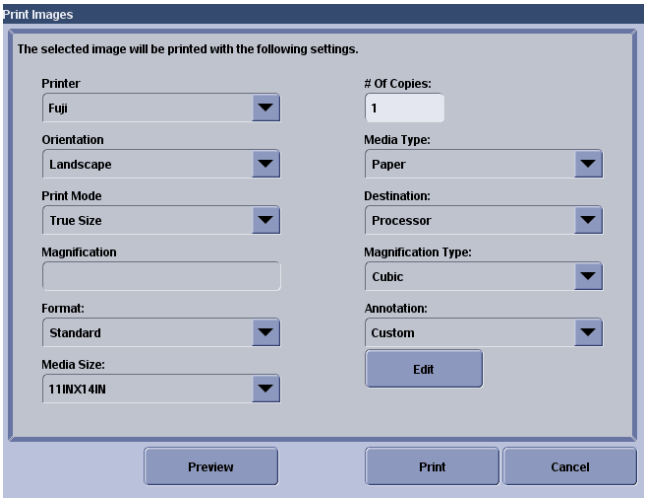

Table 7-8 Print Images field description

Field	Description
Printer	Lists all available printers configured for your system.
Orientation	Selects vertical or horizontal orientation of the image on film or paper. Available options are: • Landscape • Portrait
Print Mode	Selects what size to print the image. Available options are: • True Size • Fit to Film • Reduce Size • Orthopedic (if enabled)
Magnification	If Reduce Size is selected as the Print Mode, allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%. If True Size or Fit to Film are selected as the Print Mode, the text box remains disabled.

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Field	Description
Format	Selects the print format. Available options are: • Standard • 35 mm • 40 mm
Media Size	Shows the available sizes that are configured for the selected printer.
# of Copies	Defines how many copies to print.
Media Type	Selects the type of media to print on. Available options are: • Paper • Clear film • Blue film
Destination	Selects the destination. Available options are: • Processor • Magazine
Magnification Type	Selects the magnification type. Available options are: • Cubic • None
Annotation	Selects the amount of annotation to print on the image. Available options are: • Full • Partial • Custom • None Refer to *Annotate and Mask Images* (p. 7-9) for more information.

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Field	Description
[EDIT]	If Custom Annotation was selected, brings up a screen that allows you to choose the annotation to print on the image. Refer to *Annotate and Mask Images* (p. 7-9) for more information.
[PREVIEW]	Shows how the image will appear on the film or paper with the current settings.
[PRINT]	Prints the image.
[CANCEL]	Cancels printing.

Send Images

If Auto Send is enabled, acquired images are automatically sent to a pre-determined location on exam close. Refer to *Chapter 12: Set Preferences* for information on configuring Auto Send

Save Changes to Images

You have the option to save or discard the changes you have made to images when you close the Image Viewer screen or end the exam.

1. If in a live exam, click [CLOSE] on the Acquisition screen.
2. If in review mode, click [CLOSE] on the Image Viewer screen.
   - A message appears: “Would you like to save the changes made to the images?”
3. Click [YES].
   - [NO] closes the Image Viewer screen without saving changes.

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Chapter 8
Image Management

The Image Management screen (Figure 8-1) shows all the images stored in the selected database source. This screen is used to manage images, copy images to exams, transfer images to network hosts, or save images on CD.

Topics covered include:

- *Overview* (p. 8-1)
- *View Patient Information* (p. 8-5)
- *Select Image Database Source* (p. 8-5)
  - *Load Images from a Network Host* (p. 8-6)
  - *Load Images from a CD or DVD* (p. 8-6)
- *Search List* (p. 8-7)
  - *Sort by Column* (p. 8-7)
- *Open Exams and Images* (p. 8-8)
- *Copy Exams and Images* (p. 8-9)
  - *Copy Exams to a Network Host* (p. 8-9)
  - *Copy Images to Another Exam* (p. 8-10)
  - *Copy Exams to a CD or DVD* (p. 8-11)
- *Delete Exams, Series, or Images* (p. 8-13)
  - *Lock Exams from Deletion* (p. 8-13)
- *Make Patient Anonymous (De-Identify)* (p. 8-14)

Overview

The majority of the Image Management screen is devoted to the exam list. Images are organized by exam. Each exam is a row. If multiple exams were acquired in the same session, each exam has its own row on the list. The exam expands to show the series.

Within each exam are “series” of images. A series is a collection of one or more images acquired in a session. Each protocol is a series. A new series is created when a completed exam is appended.

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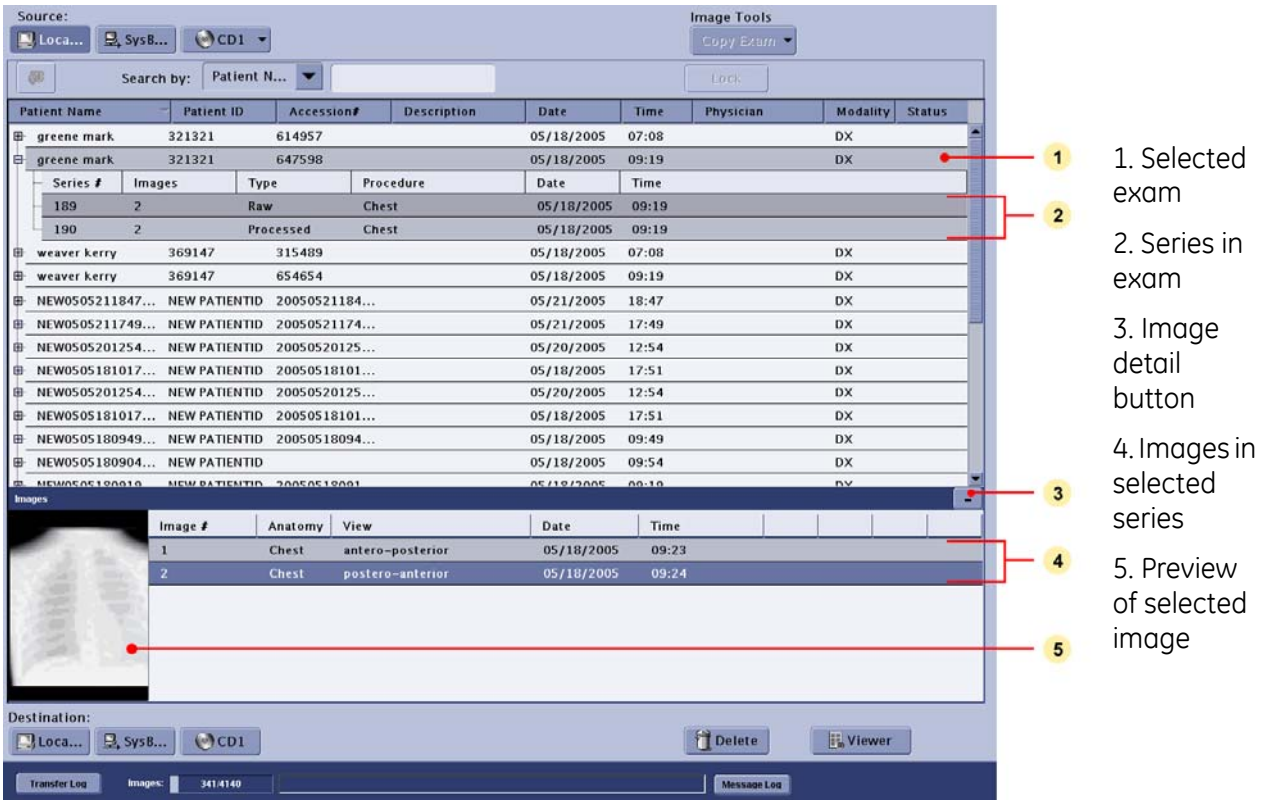
There are two types of image series: raw and processed. Raw images are the exact images that were acquired. Processed images are the raw images with specific processing and image adjustments (such as brightness and contrast) applied. It is possible to create several processed images from one raw image.

Individual images reside within the series. Double-clicking on a series or clicking the [+] button opens the image details section of the Worklist. In the Image Details section, each row is an image. Selecting a row makes a small preview image, or "thumbnail," appear. The image may be opened for viewing, adjustment, or deletion.

Selecting multiple exams on the Image Management screen is different than on the Worklist.

- The Image Management screen allows you to select exams that do not have the same Patient ID or Patient Name.
- To select a contiguous group of exams: Hold down the SHIFT key on the keyboard. Click and drag with the mouse to select the exams.
- To select non-contiguous exams: Hold down the CTRL key on the keyboard. Click on individual exams to select.

Figure 8-1 Image Management screen



1. Selected exam
2. Series in exam
3. Image detail button
4. Images in selected series
5. Preview of selected image

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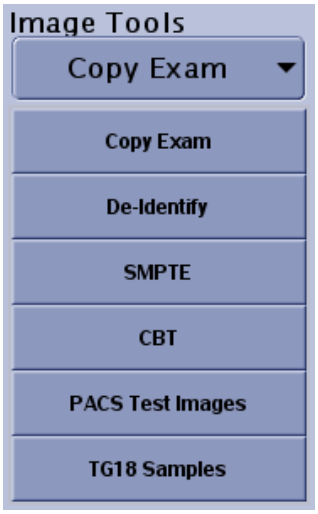
Table 8-1 Image Management screen functions

Function	Description
Source	Selects the source of images to view (e.g., the local workstation, network hosts, or a CD). Refer to *Select Image Database Source* (p. 8-5) for more information.
Image Tools 	Performs various functions on selected exams. Available options are: • Copy Exam – Allows all exam images for a patient to be copied to another patient, to another location, or to CD. Refer to *Copy Exams and Images* (p. 8-9) for more information. • De-identify – Makes the patient anonymous (removes all identifying information, including Name, ID, and accession number). Refer to *Make Patient Anonymous (De-Identify)* (p. 8-14) for more information. • SMPTE – Allows services personnel to access the SMPTE pattern for system calibration. • CBT – If available, launches Computer Based Training for the system. If Computer Based Training is not available, the option is disabled. • PACS Test Images – Loads a set of calibration images that are used to test the quality of images sent to PACS or printers. • TG18 Samples – Loads a set of test images that are used to calibrate the display monitor. **NOTE:** It is not expected that you will need to access the SMPTE pattern or test images during the course of a normal day. Test images are typically used to calibrate the system or to determine the cause of image quality problems.
[PATIENT INFORMATION] 	Shows the Patient Information screen for the selected procedure. **NOTE:** Patient Information cannot be edited once an exam has started. Refer to *View Patient Information* (p. 8-5) or *Chapter 5: Worklist-Add Patient / Edit Patient Information* (p. 5-17) for more information.
Search	Searches for procedures by the selected the column name in the drop-down list and the search criteria entered into the text box.

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Function	Description
[LOCK] or [UNLOCK] 	Locks the selected exams from deletion. If a locked exam is selected, the button name changes to [UNLOCK]. [UNLOCK] removes the lock from the selected exams.
exam list	Lists the exams and series available from the selected data source.
series detail	Shows the series for the selected exam.
image list	Shows the images for the selected series.
image preview	Shows a representative thumbnail of the selected image.
Destination	Selects where images are to be copied. Refer to *Copy Exams and Images* (p. 8-9) for more information.
[DELETE] 	Deletes the selected exams or images from the local database.
[VIEWER] 	Opens the Image Viewer screen and shows the images in the selected series. Images may be adjusted on the Image Viewer screen. Refer to *Chapter 7: Image Viewer* for more information.
[TRANSFER LOG] 	Shows a list of transferred exams and their destinations.
system status 	Displays the last system status message. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.
[MESSAGE LOG] 	Brings up the message log since the last system re-start. Refer to *Chapter 9: General Information-System Status and Messages* (p. 9-9) for more information.

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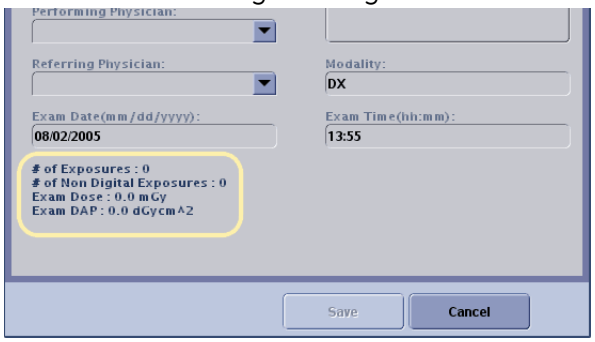
View Patient Information

When accessed from the Image Management screen, the Patient Information screen displays exam information about the acquired images in the lower left corner (Figure 8-2). All other patient information is as described in *Chapter 5: Worklist-Add Patient / Edit Patient Information* (p. 5-17).

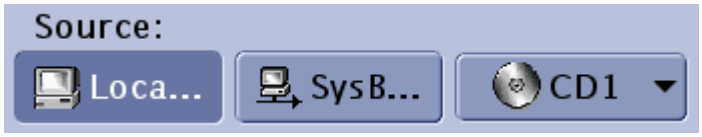
Figure 8-2 Patient Information from Image Management screen



Select Image Database Source

The Source buttons allow you to load and work with images from different locations, such as a CD, network host, or the local workstation.

Figure 8-3 Image sources



- Local – shows exams and images stored on the local workstation.
- Network – shows exams and images stored at different network hosts. If necessary, a drop-down list shows other configured network hosts.

NOTE: Depending you your system's configuration, the screen may show multiple network buttons (Figure 8-4). Additional network buttons will appear to the right of the [CD1] button.

Figure 8-4 Image sources with multiple network buttons

- CD – shows exams and images stored on a CD. The options for the drop-down list are CD and Eject CD.

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Load Images from a Network Host

Follow this process to access images stored on a network host.

1. Select the network host from the drop-down list, if necessary.
   - The filter screen appears.
2. Complete the Filter screen as appropriate.
   - Refer to *Chapter 5: Worklist-Filter List* (p. 5-10) for more information.
3. Click [OK].
   - A message appears: “Retrieving information.”
   - The Image Management screen list updates with exams from the selected source.

Load Images from a CD or DVD

Follow this process to access images stored on a CD or DVD.

1. Use the [CD1] button to open the CD/DVD tray on the workstation computer. Press the arrow and select EJECT CD from the drop-down list.
   - The tray opens.
2. Place the disk with images into the tray.
3. Close the tray. Press the Eject button below the tray or gently nudge the tray towards the computer.
4. Click [CD1].
   - The exam list updates to show the images stored on the disk.
5. Select the exams.
6. Copy the exams to the Local database. Refer to *Copy Exams and Images* (p. 8-9) for more information.
7. Click the [LOCAL] Destination button or a network Destination button.
8. A message appears: “Selected images will be copied to (destination name). Select OK to confirm.“
9. Click [OK].
10. Open the exams from the Local database or network host.

NOTE: If the exams are being viewed on a computer that has the DICOM viewer installed, images may be viewed directly from the disk.

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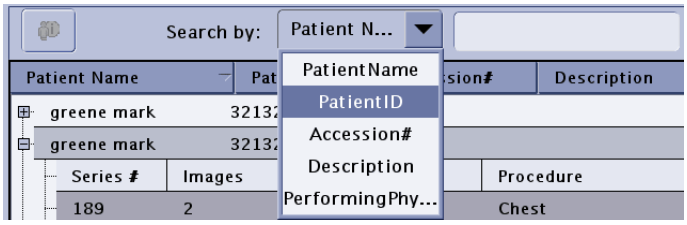
Search List

The Search feature finds procedures by column.

Figure 8-5 Search by column drop-down list



1. Click the button on the Search By drop-down list to select the column you want to search.
   - If the column you want is already selected, begin at step 3.
2. Select the column. For example, Patient ID.
   - The list automatically sorts the selected column.
3. Type the search criteria into the text box. For example, you are looking for patients whose names begin with "J", so you would type "j" into the text box.

NOTE: The text box is not case sensitive.

4. Continue typing the search criteria.
   - The list automatically selects the first procedure that matches what you have typed into the text box. This is called an incremental search.
   - If no procedures match what you have typed, the list de-selects all procedures and places the closest match at the top of the exam list.

Sort by Column

Sorting allows you to organize the procedures by the column of your choice.

1. Click on the column heading you want to sort, or choose the column in the Search By drop-down list. For example, you want to see all the procedures that were performed by a specific physician, so you click on the "Performing Physician" column heading.
   - An arrow appears in the column heading to indicate which column is currently being sorted.

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2. Click the column heading again to switch between ascending and descending order.
   - An up-pointing arrow indicates that the column is sorted in ascending order. That is, sorted in alphabetical order or numerical order from smallest to largest.
   - A down-pointing arrow indicates that the column is sorted in descending order. That is, sorted in reverse alphabetical order or numerical order from largest to smallest.

Figure 8-6 Column with descending sort

Open Exams and Images

Follow this process to open exams and images for viewing.

1. Double-click the exam to open it (or, click on the "+" icon).
   - The series for the exam expands below the exam.
2. Double-click the series to open it (or, select the series and click [+] image details).
   - The image detail opens.
3. Select the image.
   - A preview thumbnail appears.
4. Double-click on the image (or, select the image and click [VIEWER]).
   - The selected series opens on the Image Viewer screen with the selected image displayed.

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Copy Exams and Images

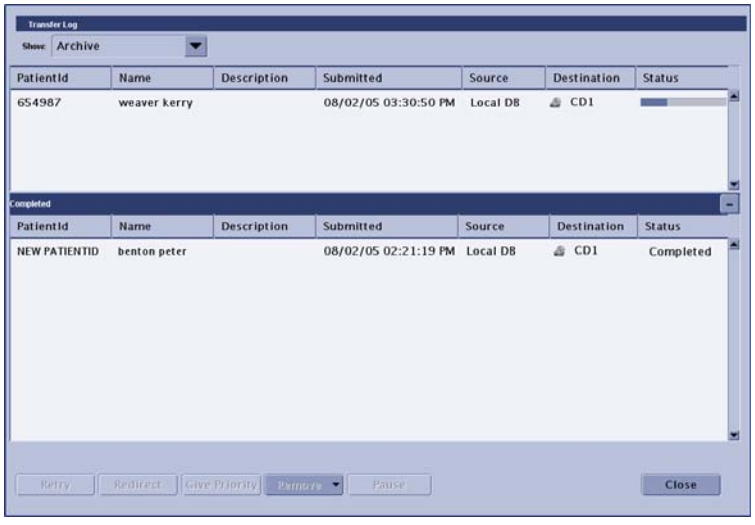
Exams (including all series and images) may be copied to a network host or to a CD/DVD. The images from one exam may be copied to another exam.

NOTE: Copying exams does not remove the exam from its original location.

Copy Exams to a Network Host

Exams may be copied from the local database to a configured network location or vice versa. Exams cannot be copied from one network host to another network host. Refer to *Chapter 12: Set Preferences-Network Connections* (p. 12-3) for information about configuring network hosts.

1. Select the exams to copy.
2. Click [DESTINATION].
   - A message appears: “Images will be copied to (host name). Select OK to confirm.”
3. Click [OK].
   - If there is a problem and the exams cannot be copied to the selected network host, a message appears: “The network destination is not responding. If the problem persists contact your network administrator.”
   - Click OK to close the message. Try copying the exams at a later time.
   - To see the status of the exams being copied, click [TRANSFER LOG] at the bottom of the Image Management screen.
   - The Transfer Log screen appears.
   - Click [CLOSE] to close the screen and return to the Image Management screen.



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Copy Images to Another Exam

This process is used to copy images from one exam to another. Copying images is used to consolidate images from multiple exams to a single exam and to reconcile patients to exams. For example, images taken for an emergency exam can be assigned to the patient's real name once the patient's information is known. Another example is to assign images that were acquired for the wrong Worklist entry to the correct patient.

Images are copied to procedures that appear on the Worklist. Once the copy is complete, the procedure is marked as "Completed" on the Worklist and the new exam appears on the Image Management screen. Images may be copied to procedures with the status of Suspended, Discontinued, or Scheduled. Images may not be copied to procedures with a status of Completed.

NOTE: You can only copy the images from one exam at a time.

NOTE: You cannot copy images to multiple Worklist procedures.

1. If necessary, create a Worklist procedure entry for the patient with the appropriate information.
   a) On the Worklist screen, click [ADD PATIENT].
   b) Enter the patient's information. Refer to *Chapter 5: Worklist-Add Patient / Edit Patient Information* (p. 5-17) for more information.
   c) Click [SAVE].
2. On the Image Management screen, select the exam to copy.
3. Switch the [IMAGE TOOLS] button to COPY EXAM, if necessary.
   - The Copy Exam screen appears.

Copy Exam
Select an exam on the worklist to receive the copied images from the benton peter – exam
Search by:
Status
Filter List
Refresh List
Date
Time
Patient Name
Patient ID
Accession#
Physician
Description
Modality
Status
08/02/2005 14:10 coruday, elizabeth NEW PATI... DX SCHEDUL...
08/02/2005 14:09 ross, douglas NEW PATI... DX COMPLE...
08/02/2005 14:09 ross, doug NEW PATI... DX SCHEDUL...
08/02/2005 14:09 romano, robert NEW PATI... DX SCHEDUL...
08/02/2005 14:07 tracey, harper NEW PATI... DX SCHEDUL...
08/02/2005 14:07 greene, mark NEW PATI... DX COMPLE...
08/02/2005 14:06 susan, lewis NEW PATI... DX COMPLE...
08/02/2005 14:06 kerry, weaver NEW PATI... DX SCHEDUL...
08/02/2005 14:06 hathaway, carol NEW PATI... DX SCHEDUL...
08/02/2005 14:05 carter, john NEW PATI... DX SCHEDUL...
08/02/2005 14:05 benton, peter NEW PATI... DX COMPLE...
08/02/2005 14:05 benton, peter NEW PATI... DX SCHEDUL...
OK
Cancel

   - The Copy Exam screen shows all Worklist entries with the status of "Scheduled", "Discontinued", or "Suspended".
4. Search or Filter the exam list to locate the destination exam.

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5. Select the exam where you want the images copied to.
6. Click [OK].
   - A message appears: “Images will be copied to the selected exam. Images will not automatically be removed from the source exam. The destination exam will be marked as Completed”
7. Click [OK].
   - The message closes.
   - A message appears: “Copying Images”
   - [CANCEL] stops the copy process, closes the message, and returns you to the Image Management screen.
   - All series and images are copied to the exam.

Copy Exams to a CD or DVD

Exams may be copied to a CD or (DVD for VolumeRAD exams) for archiving purposes, to send to a location that is not within the network, or to include with a patient’s medical records.

NOTE: The CDs or DVDs used for copying images must be recordable. That is, the disk should be labeled “CD-R” or “DVD-R”.

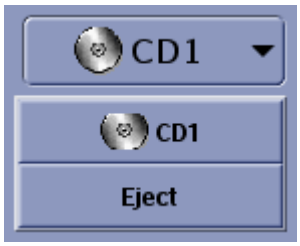
IMPORTANT!: Images cannot be saved to a re-writable disk. **Do not** use CD-RW or DVD-RW disks.

NOTE: You cannot copy exams to a disk that already has exams or other information saved on it. You will receive a message, “CD is not blank. Please insert a blank CD to proceed” when you attempt to copy images to the CD. Always use a new, blank disk.

1. Open the CD or DVD tray. (Select Eject from the [CD1] drop-down list.)

NOTE: Pressing the Eject button on the workstation PC does not open the CD tray. When working on the Image Management screen, always use the Eject option from the [CD1] drop-down list (Figure 8-7).

Figure 8-7 CD 1 button drop down list



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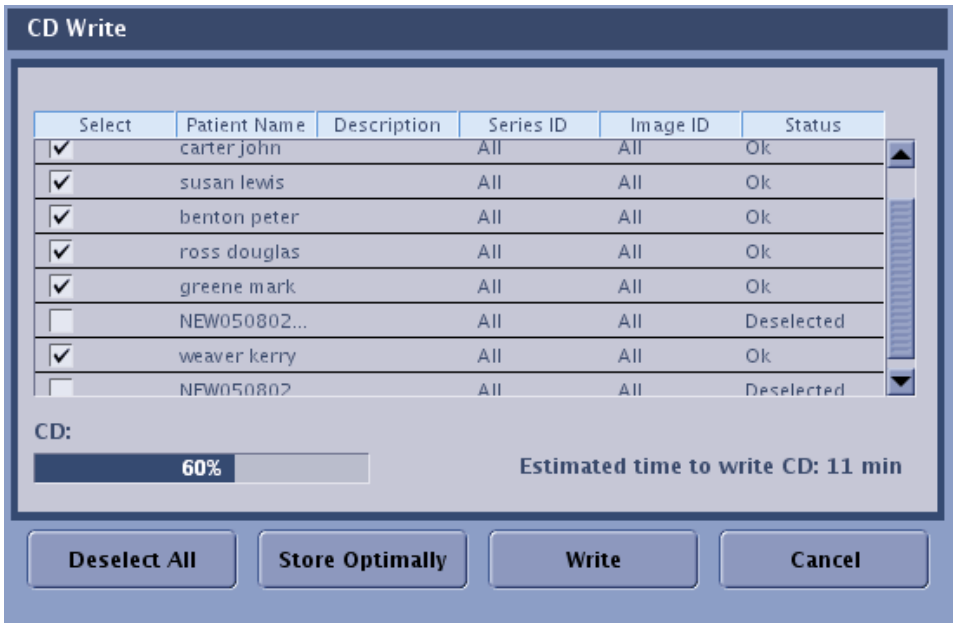
2. Insert a blank CD/DVD into the tray.
3. Close the tray.
4. Select the exams to copy.
5. Click the **Destination** [CD1].
   - The CD Write screen appears.
   - [DESELECT ALL] unchecks all exams on the list.



   - [STORE OPTIMALLY] determines which exams to copy to best utilize the space on the CD. It will automatically uncheck exams that cannot fit on the CD.
   - [WRITE] begins the copying process.
   - [CANCEL] closes the screen and returns you to the Image Management screen.
6. Confirm the exams to be copied. Uncheck any exams that you do not want saved to the disk.
7. Click [WRITE].
   - The disk begins copying. The light on the front of the computer flashes yellow as the data is being written.
   - To see the status of the exams being copied, click [TRANSFER LOG] at the bottom of the Image Management screen.
   - The Transfer Log screen appears.
   - Click [CLOSE] to close the screen and return to the Image Management screen.
   - When complete, the tray will open and close.

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8. Remove the disk.
9. Label the disk and store in a safe place.

Delete Exams, Series, or Images

Exams, series, and images may be deleted from the local database from the Image Management screen.

Follow this process to delete exams, series, and images.

1. Select the **Local** Source, if necessary.

NOTE: Items cannot be deleted from a CD or network locations.

2. Unlock exams, if necessary.
   - Refer to *Lock Exams from Deletion* (p. 8-13) for more information.
3. Select the items to delete.
   - The items may be exams, series with an exam, or images within a series. Multiple items may be selected and deleted at once.
4. Click [DELETE].
   - A message appears: "Are you sure that you would like to delete the selected items?"
5. Click [OK].
   - The message closes.
   - The items are deleted from the Image Management screen.
   - [CANCEL] closes the message and the items remain on the Image Management screen.

Lock Exams from Deletion

The Image Management screen allows you to prevent, or "lock", exams from being deleted. The exam can only be deleted if the lock is removed, or "unlocked." The lock prevents exams from being deleted by other operators and from Auto Delete. Refer to *Chapter 12: Set Preferences-Image Management* (p. 12-17) for more information about Auto Delete.

Locked exams can still be copied, transferred, and viewed.

Only exams can be locked. Individual series or images cannot be locked.

Follow this process to lock and unlock exams.

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1. Select the exams to lock.
   - Multiple exams may be selected and locked at once.
   - Pressing CTRL + A on the keyboard will select all exams in the selected image source.
2. Click [LOCK].
   - The lock icon appears in the status column of all selected exams.

   - The [LOCK] button changes to [UNLOCK].

Unlock Exams

Follow this process to unlock exams so that they may be deleted.

1. Select the locked exams.
   - The Unlock button becomes active.
2. Click [UNLOCK].
   - The lock icon is removed from the status column of the selected exams.
   - The exams may now be deleted.

NOTE: You are able to lock or unlock multiple exams even if the selected exams are a mixture of locked and unlocked. Clicking the [LOCK] button will lock all selected exams. Clicking the button again will unlock all selected exams.

Make Patient Anonymous (De-Identify)

There may be times when you want the name of a patient to be kept confidential to maintain patient privacy. You can do this using the De-Identify feature. This feature allows you to create an anonymous set of images.

The patient examinations are copied and used to create a new patient, with the name “Anonymised patient” and a unique, randomly created Patient ID as shown in Figure 8-9.

NOTE: The original exam is not modified in any way, only a copy is altered.

NOTE: Once an anonymous exam is created, there is no way to recover the patient’s identifying information.

The De-Identify option is available from the Image Tools button (Figure 8-8).

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Figure 8-8 Image Tools button

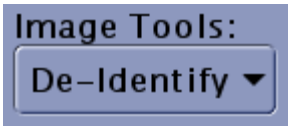

Figure 8-9 Anonymous patient

Use this process to make exam images anonymous:

1. Select the exams to make anonymous.
2. Switch the Image Tools button to [DE-IDENTIFY], if necessary.
   - A message appears: “The selected exams will be copied without patient identification. The originals will not be deleted.”
3. Click [OK].
   - The Image Management screen updates with copied, anonymous exam.

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Chapter 9
General Information

This chapter explains the startup and shutdown procedures for your system. It also explains the tube warm up procedure which is important to maximize the life of your tube.

Topics covered include:

- *System Start Up and Shut Down* (p. 9-2)
  - *Start Up* (p. 9-2)
  - *Shutdown* (p. 9-2)
- *Login and Log Off* (p. 9-4)
  - *Standard Login* (p. 9-4)
  - *Invalid Password Message* (p. 9-5)
  - *Emergency Login* (p. 9-5)
  - *Inactivity Timeout* (p. 9-6)
  - *Log Off* (p. 9-6)
- *System Reset* (p. 9-6)
- *Tube Warm Up* (p. 9-7)
- *Lead Markers* (p. 9-9)
- *System Status and Messages* (p. 9-9)
  - *Expose Hold* (p. 9-9)
  - *X-ray Tube Heat Units Remaining* (p. 9-10)
  - *System Status Area* (p. 9-10)
  - *Message Log* (p. 9-11)
  - *Audio Indicators* (p. 9-12)
- *iLinq* (p. 9-12)

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System Start Up and Shut Down

The system should remain on at all times for optimal performance. However, a controlled system shut down and start up should be performed once a week as part of routine QAP. Refer to *Chapter 11: Quality Assurance and Maintenance* for more information.

If the detector looses power for 30 minutes or more, reset the system and warm the detector with active power in "on" state for at least 30 minutes. Refer to *System Reset* (p. 9-6) for more information.

WARNING: Do not attempt to acquire images during the 30 minute warm up period. Attempting to acquire images could cause irreparable damage to the detector.

Start Up

1. Press the Power On button on the RCIM.

Figure 9-1 Power button on RCIM

2. Wait 3 minutes to get power on the whole system.
   - The system powers up automatically.
   - If enabled, the Login screen appears on the left monitor when the system is ready. Refer to *Login and Log Off* (p. 9-4) for more information.
   - If Login is not enabled, the Worklist appears on the left monitor when the system is ready. Refer to *Chapter 5: Worklist* for more information.

Shutdown

CAUTION: Do not to turn the system off if the tube fan is running. Wait for the tube to cool and for the fan to stop.

1. Close all current exams.
2. Click the [UTILITY] button at the top of the Worklist screen.

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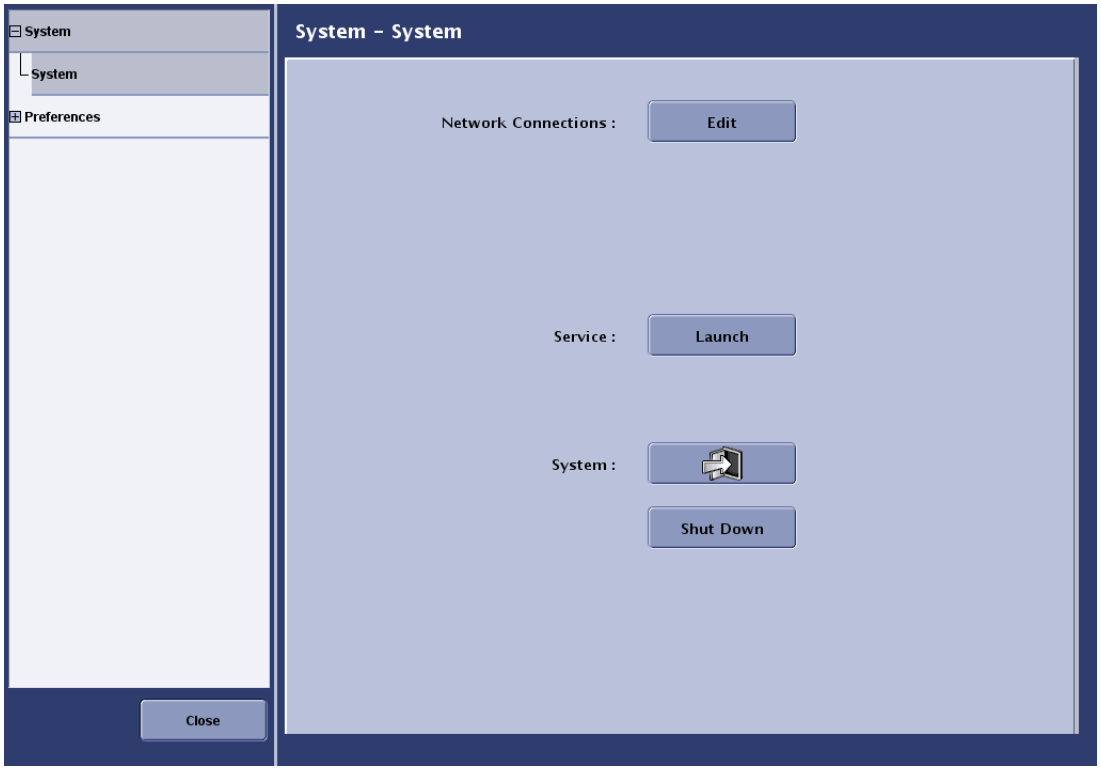
Figure 9-2 Utility button

3. Select System on the Utilities screen.

Figure 9-3 Utilities – System screen



4. Click [SHUTDOWN].
   - A message appears: “The system will be shut down.”
5. Click [YES] to proceed with shut down.
   - The system powers off and the monitors go blank.
   - [CANCEL] stops the system from shutting down and returns you to the Utilities screen.

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Login and Log Off

This following sections apply if the system is configured for login ability in the Service User Interface.

Refer to *Appendix B: Login Administration* for information about administering the login function.

Standard Login

The login screen (Figure 9-4) appears when the system is started, reset, and after a user logs off. The system may also be configured to display the login screen if the system has been inactive for a specified period of time (inactivity timeout).

Figure 9-4 Example login screen

Follow this process to log on to the system.

1. Start up the system or log off the previous user.
   - The login screen appears.
2. Type in your Login Name, if necessary.
3. Type in your Password.
4. Click [LOGIN].
   - The Worklist appears.

NOTE: If you have administrator access, a message appears: "You have both regular user and admin user privileges. To access the admin screen, select the check box before continuing with the login, otherwise just continue with the login."

- To login and begin working with the unit, press [LOGIN] and the Worklist appears.
- To login and access login administrator functions, select the Enter admin screen checkbox and then press [LOGIN]. The login Administration screen appears. Refer to *Appendix B: Login Administration* for more information.

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Invalid Password Message

Your password must be entered correctly for you to log in. If the password you entered is not the correct password for the entered login Name, an error message will appear in the top portion of the Login screen: "An Unknown error has occurred. Please try again or contact your System Administrator for more details."

If you see the error message, do the following:

1. Make sure that the correct **Login Name** is displayed in the field. Depending on the configuration, the login Name may be case sensitive. That is, "aBc" is not the same login Name as "Abc."
2. Retype your **Password** carefully. Your password is case sensitive; that is, "xYz" is not the same password as "Xyz."
3. Click [LOGIN].
   - Contact your technical support group if you still are not able to login.

Emergency Login

Emergency Login is a HIPAA required function to allow quick access to medical systems in the event of an emergency. Depending on the system's configuration, this option may not be available. Refer to *Appendix B: Login Administration* to configure the Emergency login function.

Emergency login will allow exposures, but does not allow connection to HIS/RIS or PACS hosts.

CAUTION: The Emergency Login function should NOT be used when there is time to login normally, when there is time to receive assistance from technical support, or if there is no emergency situation. Your facility may track the use of this function.

1. Press [EMERGENCY LOGIN].
   - Depending on the system's configuration, you may be prompted to enter your name. Enter your name and click [LOGIN].
2. The Worklist screen appears.

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Inactivity Timeout

Depending on the system's configuration, the system may show the Login screen after a specified period of inactivity. The Login screen acts as a screen saver, covering displayed information to protect patient privacy.

The administrator configures if the system will timeout and how long the system must be inactive before the Login screen appears. Refer to *Appendix B: Login Administration* to configure the inactivity timeout function.

To access the system screens, follow the *Standard Login* (p. 9-4) or *Emergency Login* (p. 9-5) process described above.

Log Off

1. Close, suspend, or discontinue any open exams, if necessary.
2. Close the Image Viewer, if necessary.
3. Click [LOGOFF] at the top of the Worklist screen.
   - Or open the Utility screen, go to **System** and click [LOGOFF] (Figure 9-5).

Figure 9-5 Utilities screen logoff button

   - A message appears: "Do you really want to log off?"
4. Click [OK].
   - The login screen appears.
   - [CANCEL] closes the screen and returns you to the last screen.

System Reset

System reset is used as a last resort if the workstation software stops working. A system reset may take 3 minutes to complete.

CAUTION: Do not to turn the system off if the tube fan is running. Wait for the tube to cool and for the fan to stop.

NOTE: The system will not be available for acquiring images during the reset cycle.

1. If possible, close, suspend, or discontinue any open exams.
2. If possible, log off the system.

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3. Press and hold the RESET button on the RCIM until you hear the beep or the monitor screens go black with white text.

Figure 9-6 Reset button on RCIM

4. Release the button and wait until the Login or Worklist screen appears.
   - As the system resets, various screens will appear on the monitors. This is normal.
   - The system will auto-start and the Login screen or Worklist screen will appear when the system is ready.

Tube Warm Up

Tube warm up is a procedure that brings the X-ray tube up to a normal operating temperature. The tube has to be brought to this temperature slowly. Tube warm up should be done if no exposures have been made within two hours. This makes the life of the tube last longer.

CAUTION: Initiating an exposure when the X-ray tube is cold may damage the tube target.

Click [WARM TUBE] (Figure 9-7) at any time to see the tube heat status.

Figure 9-7 Warm Tube button

Figure 9-8 Warm Tube screen

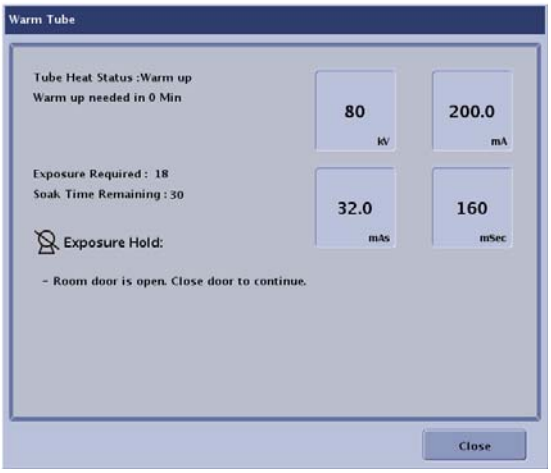

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Table 9-1 Warm Tube functions

Function	Description
Tube Heat Status	Shows the current status of the tube.
Warm up needed in __ Min	Shows how many minutes until the tube needs to be warmed. A time of 0 minutes means that the tube must be warmed immediately.
Exposure Required	Shows the number of exposures required to warm the tube.
Soak Time Remaining	Shows how many seconds of soak time remain.
Exposure Hold	Lists any inhibits to making an exposure or warming the tube.
kV	Shows the kV of the current exposure.
mA	Shows the mA of the current exposure.
mAs	Shows the mAs of the current exposure.
mSec	Shows the mSec of the current exposure.
[CLOSE]	Closes the Warm Tube screen.

Follow this process to warm up the tube.

WARNING: X-rays are generated during tube warm up. Use proper radiation practices at all times.

1. Check the room to make sure it is clear of other personnel before making X-ray exposures.
2. Click [WARM TUBE] on the Worklist screen.

NOTE: Because the tube warming procedure produces x-rays, it cannot be performed when an exam is open. If the tube must be warmed before the exam can begin, suspend the exam and remove the patient and any others from the room before warming the tube. Refer to *Chapter 6: Image Acquisition-End Exam* (p. 6-22) for more information.

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3. Correct any exposure holds.
4. Press the Hand-switch Prep/Expose button to the Expose position and hold until the **Exposures Required** reads "0".
   - The exposure hand switch should be held for 18 exposures to ensure proper tube warm up. The Exposures Required number counts down as each exposure is made.
5. Wait until the **Soak Time** reads "0".
6. Click [CLOSE] to finish tube warm up.
   - You may now continue taking x-rays.

Lead Markers

As in any General Radiography procedure, lead marker placement is important to ensure markers are properly recorded on the image. Place the lead marker in an area of patient attenuation. If lead markers are placed in regions of direct radiation (saturation), there is a high risk they will be processed out of the image during image processing. Saturated areas beyond the anatomy are no longer part of the final image. This is most likely to happen on high technique exposures.

CAUTION: Exercise care when placing lead markers to guarantee their presence in the final image. Every attempt must be made to assure markers are not located in regions of direct radiation, but are located in regions where some patient attenuation of radiation is present without obstructing the anatomical information of interest.

System Status and Messages

Several types of messages and indicators are displayed on the Acquisition Workstation screens to inform you of the system and subsystem operational status as well as error messages. The complete list of error messages is available in the Service Manual.

Expose Hold

The Expose Hold button (Figure 9-9) appears at the bottom of the Worklist or Acquisition screens when there is some condition that prevents an x-ray from being taken, such as the exam room door being open or the tube is not in alignment with the detector.

The Expose Hold light on the RCIM and the OTS User Interface will also light up when there are inhibits to exposures.

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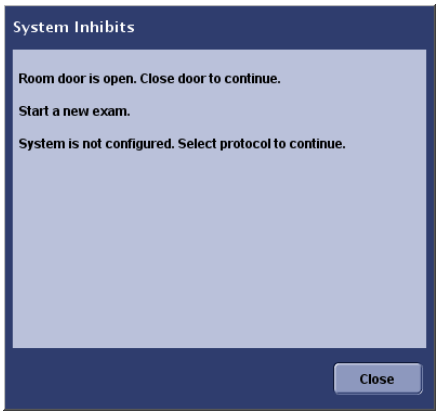
Click the Expose Hold button to view a list of all errors and interlocks that are preventing the exposure (Figure 9-10). You may also press the Expose Hold button on the OTS User Interface control screen to view the inhibits list. The items are removed from the list as they are corrected. The Expose Hold button disappears when all errors and interlocks are corrected.

Figure 9-9 Worklist and Acquisition screen Expose Hold button

Figure 9-10 System Inhibits list


System Inhibits
Room door is open. Close door to continue.
Start a new exam.
System is not configured. Select protocol to continue.
Close

X-ray Tube Heat Units Remaining

The Heat Units Remaining area (Figure 9-11) on the bottom of the Worklist and Acquisition screens shows the available capacity for the tube to absorb heat before it must be allowed to cool. A high percentage indicates that the tube is relatively cool and is able to take multiple exposures.

If the tube becomes too warm (20% heat units or less), exposures will be inhibited until the tube cools to a functional level.

Figure 9-11 Heat Units Remaining status

System Status Area

System status messages are displayed on the bottom of all main Workstation screens (Figure 9-12). System Status messages are displayed when the system detects an irregularity in system operation. The message informs you when remedial action is required to correct the situation.

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A console beep announces the arrival of an informational message. There are situations where a system condition is detected that does not require stopping the procedure. The message tells you to Continue or to Continue/Call Service (continue and call service).

NOTE: To clear the system status area, open the Message Log (described below) and close it again.

Figure 9-12 Example of a System Status message

Message Log

Clicking the Message Log button at the bottom of any screen opens the Message Log (Figure 9-13). The Message Log shows all status messages since the last system restart. The messages are listed in descending chronological order, that is, the latest message is listed first. This screen allows operators and service personnel to display, review, and analyze system status messages.

Figure 9-13 Message Log

Message Log
15:16:15 Failed to connect to remote MWL Server. Returning previously retrieved MWL entries.
800118 Failed to connect to remote worklist Server. Returning previously retrieved worklist entries.
15:06:15 Failed to connect to remote MWL Server. Returning previously retrieved MWL entries.
800118 Failed to connect to remote worklist Server. Returning previously retrieved worklist entries.
15:04:47 X-ray exposures may not be possible. Reset and call service if the problem persists.
600400 Filter-change Error
14:57:21 X-ray exposures may not be possible. Reset and call service if the problem persists.
600400 Filter-change Error
14:56:15 Failed to connect to remote MWL Server. Returning previously retrieved MWL entries.
800118 Failed to connect to remote worklist Server. Returning previously retrieved worklist entries.
Close

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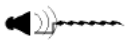
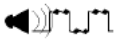
Audio Indicators

There are several audio system indicators you can expect to encounter during operation. Table 9-2 provides a summary of the major audio indicators.

Table 9-2 Audio Indicators

Name/Visual Indicator	Audio Indicators	Cause	Comment
X-Ray On (RCIM light)		Occurs during normal procedures in all X-ray exposure modes when there is a visual indicator but no audible tone.	Normal operation.
Heat Wait		Results when the selected technique would exceed the total heat storage capacity of the tube target.	Further exposures are inhibited. The display automatically resets when the tube has enough heat units remaining to complete the selected technique. Heat Wait tone is an optional feature. This tone is only available if the system is configured to use it.

iLinq

iLinq is an optional feature of your system that allows access to remote service and clinical applications support.

The iLinq system lets authorized Service Engineers and Applications Specialists, located at GE Medical Systems' Service Support Centers, access X-ray systems (with your permission) to provide the following services:

- Faster Emergency Service response
- Customer Applications training and assistance
- System troubleshooting and diagnostics
- Accumulate system information for failure analysis, resolution and prediction to assist in maintaining optimal X-ray system performance

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Figure 9-14 iLinq Main Screen

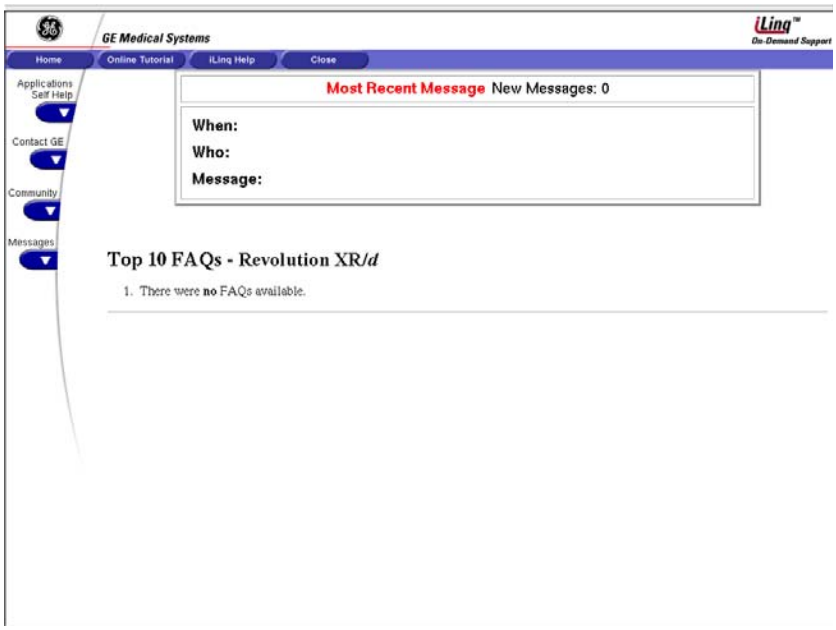

Table 9-3 iLinq Screen functions

Function	Description
Applications Self Help	Provides applications protocol descriptions, newsletters, and a list of frequently asked questions as well as additional TiP (Training in Partnership) educational opportunities
Contact GE	Allows the electronic submission of a service request or applications question directly to the Online Center. Figure 9-15 shows the screen you use to report a problem with your system, using the iLinq system.
Community	Connects you to GE Medical Systems' online community of experts.
Messages	Receives messages from the Online Center.
Online Tutorial	Access online training for iLinq features.
ILinq Help	Provides help for all of the iLinq features. In order to receive detailed help on a particular topic, simply make your selection from the items to the left side of the screen by clicking on them.
Close	Closes iLinq and returns you the Definium 8000 system.

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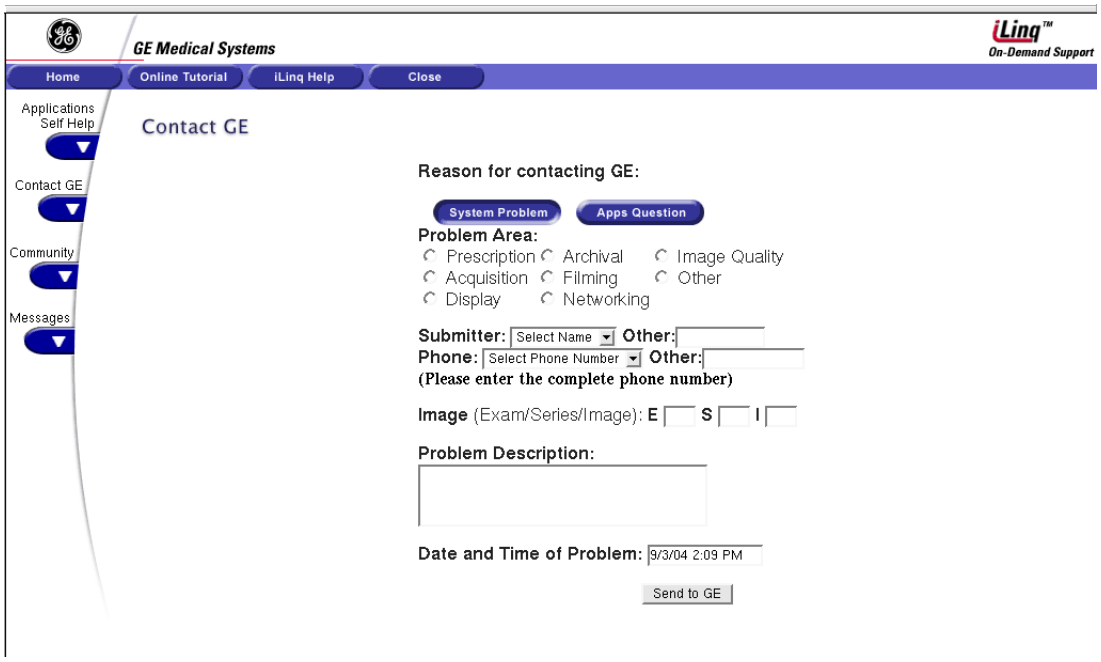
Figure 9-15 iLinq Contact GE screen



Use this procedure to connect to the iLinq system when you need to report a problem with your system.

1. Click the [iLinq] icon on the Worklist or Acquisition screens.
2. Click [CONTACT GE].
3. Enter the required information into the Contact GE iLinq screen.
4. Click [SEND TO GE].
5. Click [CLOSE].
   - iLinq closes and returns you to the Worklist or Acquisition screens.

Installation and use of the iLinq system is limited to GE Customers with an X-ray system that is under warranty or covered by a valid GE Service Contract, in accordance with the terms and conditions of the iLinq Agreement or GE Service Contract. The presence of the GE iLinq system alone, at a your site, does not provide you any rights or title to the iLinq system or any license or right to access, use or decompile the iLinq system. Any access to or use of the iLinq system beyond the conditions specified in the iLinq Agreement or GE Service Contract; or any decompilation of the iLinq system by anyone other than GE personnel is prohibited. By signing the iLinq Agreement, you agree to use reasonable effort to protect the iLinq system against damage or loss and to prevent access to, use of or decompilation of the iLinq system by unauthorized personnel.

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Chapter 10
Quick Step Guides

This section provides an overview of common tasks. Refer to the relevant chapters for detailed information.

Topics covered include:

- *Hardware* (p. 10-1)
  - *Hand-switch* (p. 10-1)
  - *Emergency Stop button* (p. 10-2)
  - *Raise and Lower the Digital Table* (p. 10-2)
  - *Position the Table Longitudinally and Transversely* (p. 10-3)
  - *Adjust the Overhead Tube Suspension (OTS) Position* (p. 10-3)
  - *Adjust the Tube Position* (p. 10-4)
  - *Rotate the Multi-Leaf Collimator* (p. 10-5)
- *General Acquisition* (p. 10-5)
- *Manual Patient Entry* (p. 10-7)
  - *Add Patient* (p. 10-7)
  - *Edit Patient Information* (p. 10-7)
- *Advanced Applications and Options* (p. 10-7)
  - *Image Pasting Acquisition* (p. 10-7)
  - *Initiate Auto Positioning* (p. 10-9)
    - *Auto Positioning from Worklist Screen* (p. 10-9)
    - *Auto Positioning from Image Acquisition Screen* (p. 10-10)
    - *Auto Positioning from Wall Stand Hand Control* (p. 10-10)
- *Login Administration* (p. 10-11)

Hardware

This following lists the basic processes for working with the system hardware. Refer to *Chapter 3: Hardware Overview* for more information.

Hand-switch

1. Make sure your patient and the console are set up for the procedure.
2. Press the Prep/Expose button to the PREPARE position.
3. Press the Prep/Expose button to the EXPOSE position.
4. Release the Prep/Expose button after the exposure is completed.

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Emergency Stop button

1. In an emergency situation, press the Emergency Stop button in with force.
2. Resolve the emergency situation.
3. When normal conditions are confirmed, turn the button clockwise.
4. At the Acquisition workstation, click the [OK] button on the Emergency Stop screen.
   - The system will power up automatically.

WARNING: When the Emergency Stop button has been activated, the table will move freely. The table is not locked into position. Exercise extreme caution with your patient when this happens.

Raise and Lower the Digital Table

1. Release the table lock, if necessary.
2. To raise the table, press the Up pedal two consecutive times (“double-tap”). This activates the foot pedal.
3. Hold the foot pedal down until the desired height is reached.
4. Remove your foot from the pedal to stop the movement.
5. To lower the table, press the Down pedal two consecutive times (“double-tap”).
6. Hold the foot pedal down until the desired height is reached.
7. Remove your foot from the pedal to stop the movement.

WARNING: Before your patient gets on or off the digital table, always press the Table Lock Control button to block the control foot pedal functions momentarily. This avoids injuries to the patient or damage to the equipment if a foot pedal is accidentally stepped on.

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Position the Table Longitudinally and Transversely

1. Release the table lock, if necessary.
2. Press the either outer foot pedal two consecutive times (“double-tap”). This activates the foot pedal.
3. Hold the foot pedal down and position the table top.
   - You can float the table top in all directions while the pedal remains held down.
4. Manually move the tabletop in a longitudinal or transverse direction to the desired position.
5. Release the foot pedal to lock the tabletop.

WARNING: When moving the tabletop, be careful of where your and the patient’s fingers are placed. Do not attempt to move the tabletop without using the foot pedals to release the longitudinal and transverse movement locks.

WARNING: To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

Adjust the Overhead Tube Suspension (OTS) Position

1. Use the Longitudinal Lock Release button to move the OTS along the bridge of the overhead rail system.
   a) Press and hold the Longitudinal Lock Release button on the User Interface.
   b) Move the OTS to the desired position.
   c) Release the Longitudinal Lock Release button.
2. Use the Vertical Lock Release button to move the telescopic column up and down.
   a) Press and hold the Vertical Lock Release button on the User Interface.
   b) Move the telescopic to the desired vertical position.
   c) Release the Vertical Lock Release button.

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3. Use the Lateral Lock Release button to move the OTS carriage from side to side on the bridge.
   a) Press and hold the Lateral Lock Release button on the User Interface.
   b) Move the OTS carriage to the desired position.
   c) Release the Lateral Lock Release button.
4. Use the All-Lock, Lock Release button to simultaneously move the OTS in vertical, lateral and longitudinal directions.
   a) Press and hold the All-Lock, Lock Release button on the User Interface.
   b) Move the OTS to the desired position.
   c) Release the All-Lock, Lock Release button.

NOTE: Detents remain activated if the detent button is selected.

Adjust the Tube Position

1. Use the Tube Angulation Lock Release button to rotate the tube about the short axis (cranial to caudal).
   a) Press and hold the Tube Angulation Lock Release button on the User Interface.
   b) Move the tube unit to the desired angle.
   c) Release the Tube Angulation Lock Release button.
2. Use the TSU Rotation Detent Release lever to rotate the tube about the vertical axis of the telescopic column.
   a) Press the Rotation Detent button on UI (lower right).
   b) Rotate the tube unit.
   c) Release the button to hold position.

WARNING: - Potential Pinch Point: The area where the tube connects to the column may create a pinch point when the tube is rotated. Operators should keep their hands on the OTS handle and keep patient's clear while rotating the tube.

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Rotate the Multi-Leaf Collimator

1. Move the locking lever on the multi-leaf collimator toward the front panel, i.e. toward you. This releases the collimator from the 0 lock-in position.
2. Grasp the multi-leaf collimator with both hands.
3. Rotate it to the desired angle and direction.
4. Return the locking lever to its original position. This prevents further rotation.

NOTE: When the collimator is rotated, the image border is adjusted to the maximum size based on the selected collimator FOV.

WARNING: Always grasp the multi-leaf collimator in such a way that neither hand can be pinched or crushed between the handles and the collimator.

General Acquisition

This section outlines the basic acquisition process.

Refer to *Chapter 5: Worklist* for more detailed information on adding or selecting procedures to perform.

Refer to *Chapter 6: Image Acquisition* for more detailed information about the Acquisition screen functions, how to conduct specific types of exams, and how to end exams.

1. Add or select the procedure from the Worklist.

CAUTION: Select all procedures for the patient.

2. Click [START EXAM] or [RESUME EXAM].
3. Select the protocols for the exam.
4. Click [ACCEPT].
5. If multiple procedures were selected from the Worklist, choose the exam to perform.
6. Choose the protocol to perform.
7. Select the Patient Size. The system default is Medium Adult.
8. Choose the Receptor: Table, Wall stand, or Table top (cassette).
9. Choose AEC or Fixed mode (if applicable for the protocol).

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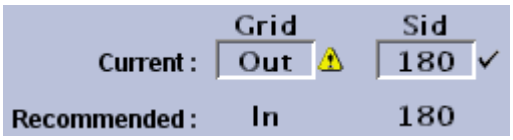
10. Confirm or adjust the Grid and SID status.

Figure 10-1 Grid and SID position



- An alert icon appears if the current Grid or SID is not in the recommended position for the technique.
- A checkmark appears if the current Grid or SID is in the recommended position for the technique.
- Figure 10-1 shows the Grid not in the recommended position and the SID in the recommended position.

11. Make technique adjustments as necessary: kV, mA, Focal spot, Cu Filer, and Ion chambers (AEC mode only).
12. Position the patient on the table or in front of the wall stand as appropriate.

WARNING: If using AEC mode, collimation must be active over the ion chambers being used. If it is not possible to collimate over the selected ion chambers, then FIXED mode must be used in order to prevent possible patient over-exposure.

13. Confirm or adjust the Patient Side field, if applicable.
14. Confirm or adjust the Patient Position field.
15. Confirm or adjust the Asymmetric Collimation (wall stand only).
16. Collimate and shield as appropriate for the exam.
17. Make exposure using the hand-switch.
18. Confirm image quality.
19. Make additional exposures as needed.
20. When all exams are complete, click [CLOSE].

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Manual Patient Entry

Add Patient

Use this procedure to enter the patient's information into your system.

1. Open the Worklist screen.
2. Click [ADD PATIENT].
3. Enter the patient information.

CAUTION: Make sure the patient's name, ID number, birth date, and gender information are entered correctly.

4. Click [SAVE] or [START EXAM].

Edit Patient Information

Patient information can only be edited before any procedure has been opened.

1. Select the procedure from the Worklist.
2. Click [PATIENT INFORMATION].
3. Edit the information as necessary.
4. Click [SAVE] to record the changes and return to the Worklist.

Advanced Applications and Options

Image Pasting Acquisition

This section outlines the process to acquire images for an Image Pasting exam.

Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more detailed information about Image Pasting.

Refer to *Chapter 5: Worklist* for more detailed information on adding or selecting procedures to perform.

Refer to *Chapter 6: Image Acquisition* for more detailed information about the Acquisition screen functions, how to conduct specific types of exams, and how to end exams.

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1. Place the patient positioner in front of the wall stand and secure the floor locking mechanism.
2. Select the patient from the Worklist (or add patient if necessary).
3. Select the **Image Pasting** protocol from the Select Protocols screen.
   a) Select the **Image Pasting** category.
   b) Select the Exam (**Spine** or **Leg**).
4. Click [ACCEPT].
5. On the Acquisition screen, select the view to perform.
6. Select the **Patient Size**.
7. Adjust the technique.
8. Position the tube at the appropriate SID.
   - If your system has Auto Positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING and POWER buttons on the RCIM until the tube stops moving.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position.

9. Stand the patient in front of the patient positioner.
10. Determine the Center of Interest (COI) with the ruler included on the patient positioner.
11. Enter the COI value on the OTS control screen. Press the [+] and [-] buttons on the control screen to enter the COI.
12. Activate the detents.
13. Instruct the patient to close his or her eyes.
14. Turn on the collimator light.

WARNING: Laser radiation. Peak power 1 mw / wave length 540-700 nm / class II laser product. Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision.

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15. Aim laser light at top of desired image field.
    - You may do this by either rotating the tube or by keeping the tube at 90° and moving the column vertically.
16. Press [HEAD] on the OTS control screen.
17. Aim laser light at the bottom of the desired image field.
    - You may do this by either rotating the tube or by keeping the tube at 90° and moving the column vertically.
18. Press [FOOT] on the OTS control screen.
19. Adjust the lateral collimation.
20. Press the [SET] button on the OTS control screen when finished.
    - The OTS will move into position.
21. Make exposure using the hand switch. Hold the exposure button down until all exposures have been made.
    - Press the OTS control screen or the Emergency Stop button on the RCIM to stop acquisition.

Initiate Auto Positioning

This section describes how to use Auto Positioning.

Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning* (p. 13-28) for more detailed information about the Auto Positioning function.

Auto Positioning from Worklist Screen

Follow this process to initiate Auto Positioning from the Worklist.

1. Confirm or change the **Auto Positioning** selection.
2. Press and hold the AUTO POSITIONING and POWER buttons on the RCIM.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position.

3. Continue to begin the exam as described in *Chapter 6: Image Acquisition*.

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Auto Positioning from Image Acquisition Screen

Follow this process to activate Auto Positioning from the Image Acquisition screen.

1. Select the patient procedure from the Worklist or add the patient to the Worklist.
2. Select the exam and view to perform.
3. Adjust exam techniques as appropriate.
4. Position the patient on the table or in front of the wall stand as appropriate.
5. Confirm or change the **Auto Position** selection.
6. Press and hold the AUTO POSITIONING and POWER buttons on the RCIM.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position.

7. After motion stops, make final adjustments to the tube position, if necessary.
8. Continue the exam as described in *Chapter 6: Image Acquisition*.

Auto Positioning from Wall Stand Hand Control

1. Press and hold the Auto button and the button for the desired location (Walls stand, Table, or Park).
2. Hold down both buttons until the tube reaches the selected position.
   - The tube will stop moving if one or both buttons are released before the tube reaches the selected position or if another location button is pressed. Repeat steps 1 and 2 to resume tube movement.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position.

3. Make final adjustments to the tube position, if necessary.

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Login Administration

This section describes the basic process for creating groups and users on a local system. Refer to *Appendix B: Login Administration-Administering Groups and Users* for more information.

1. Login to the system as an administrator.
2. Create the group.
   - Group names must be all lowercase
   - Group names cannot have spaces (use underscores)
3. Assign privileges to groups.
4. Click [APPLY GROUP SETTINGS].
5. Create the user.
   - User names must be all lowercase
   - User names cannot have spaces (use underscores)
   - Users cannot be named “operator”, “admin”, or “administrator”
6. Assign users to groups.
7. Click [APPLY USER SETTINGS].

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Chapter 11
Quality Assurance and Maintenance

This chapter explains the Quality Assurance and Maintenance process for your system. To assure continued performance of this X-ray equipment, a periodic inspection program must be established. Daily functional checks should be part of this program.

Topics covered include:

- *Quality Assurance Process* (p. 11-1)
- *When to Perform QAP* (p. 11-2)
- *Phantoms* (p. 11-2)
- *Acquisition Screen Overview* (p. 11-3)
- *Perform QAP* (p. 11-5)
- *Result History* (p. 11-13)
- *Maintenance* (p. 11-14)
  - *Periodic Maintenance* (p. 11-14)
  - *X-ray Generator Specifications* (p. 11-14)
  - *X-ray Tube Ratings* (p. 11-14)
  - *Qualified Service* (p. 11-14)
  - *Cleaning and Disinfecting* (p. 11-15)

Quality Assurance Process

The Quality Assurance Process (QAP) consists of a series of tests that should be performed weekly on your system to quantify image quality. Many of the background tasks in this procedure have been automated and require the acquisitions to be performed in the prescribed order.

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When to Perform QAP

QAP should be performed

- On a scheduled, weekly basis.
- When the alert icon appears on the QAP button (Figure 11-1) located at the bottom of the Worklist or Acquisition screens.
- When there is a perceived loss of image quality.

Figure 11-1 QAP button with alert icon

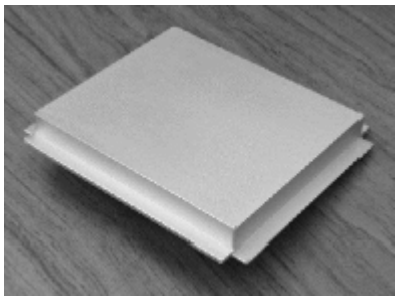
Phantoms

There are two types of phantoms used in the QAP process. The first phantom is the Flat-Field Phantom and the second is the Composite QAP Phantom (also known as the IQST Phantom). The system prompts you as to which phantom to use from the respective acquisition screens. There are recommended exposure techniques for the phantoms. The exposure is automatically set by the system but you should verify the settings prior to making an exposure.

The flat-field phantom (Figure 11-2) is used to check the following factors:

- Brightness Non uniformity Global
- Brightness Non uniformity Local
- Signal to Noise Ratio (SNR) Non uniformity
- Artifacts Number of Bad Pixels

Figure 11-2 Flat-field phantom



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The composite phantom (or IQST Phantom) consists of two pieces, the carrier (Figure 11-3), and the phantom itself (Figure 11-4). This phantom is used to check MTF (Modulation Transfer Function).

Figure 11-3 Composite phantom and carrier

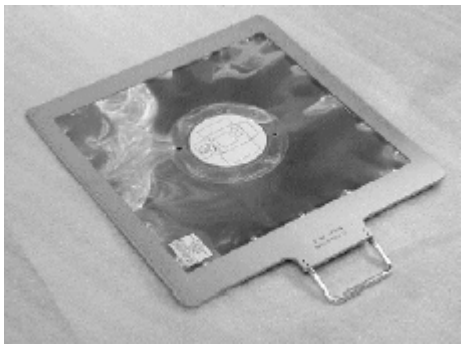
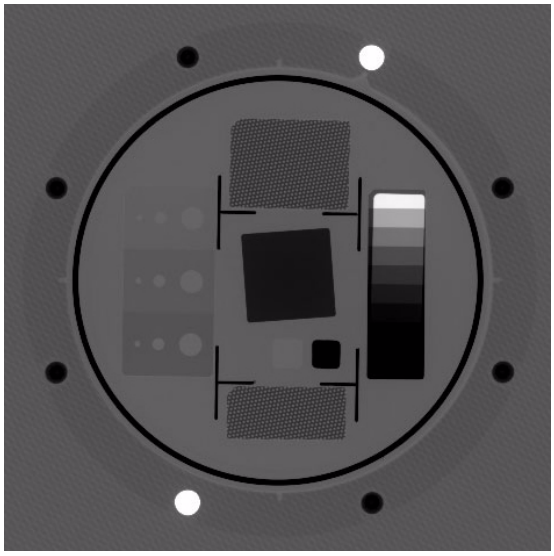


Figure 11-4 Composite phantom exposed



Acquisition Screen Overview

There are several acquisition screens used during the QAP process. These screens are automatically loaded into the acquisition system at the beginning of the QAP procedure.

When the QAP icon, located on the bottom of the Worklist and Acquisition screens, is activated, the first acquisition screen is displayed. The left and center panes of the screen contains buttons to control the program. The right pane provides information and instructions.

Table 11-1 lists the symbols that appear on QAP screen and describes their function.

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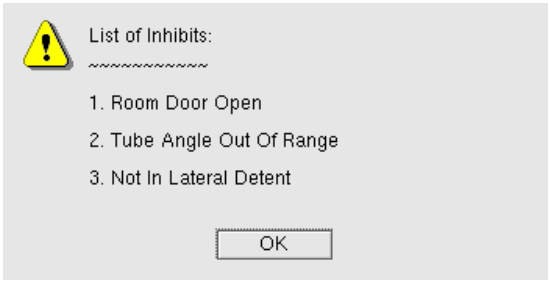
Table 11-1 QAP symbols

Symbol	Description
	QAP button. Begins QAP when clicked on the Worklist screen. The yellow alert icon appears when QAP should be performed to ensure system performance.
	Exit. Closes QAP and returns you to the Worklist.
	Inhibit. The button appears when there is an inhibit or interlock preventing image acquisition. Click the button to bring up a list of inhibits (Figure 11-5). Unlike the Acquisition screen, the list of inhibits does not update automatically as the conditions are corrected. Click [OK] to close the list and click [INHIBIT] again to view an updated list. **Figure 11-5** Example list of inhibits 
	Start Table test. Begins QAP testing for the table receptor.
	Start Wall Stand test. Begins QAP testing for the wall stand receptor.
	Back. Takes you back to the previous screen. This button is disabled while tests are being performed.
	Abort. Stops QAP and returns you to the QAP Start screen.

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Perform QAP

Follow this process to perform QAP.

NOTE: Before starting QAP, be sure to do the following:

- Detent the tube to center of detector that is to be tested
- Clear all objects from receptor cover and beam path
- Close or suspend any open exams
- Close any exam being reviewed

The QAP process begins when the QAP button (Figure) is clicked. The button is located at the bottom of the Worklist and Acquisition screens on the left monitor.

NOTE: QAP cannot be performed if an exam is open or being reviewed.

1. Click the [QAP] button on the Worklist screen.
   - The Image Quality screen appears (Figure 11-6).

Figure 11-6 Image Quality screen

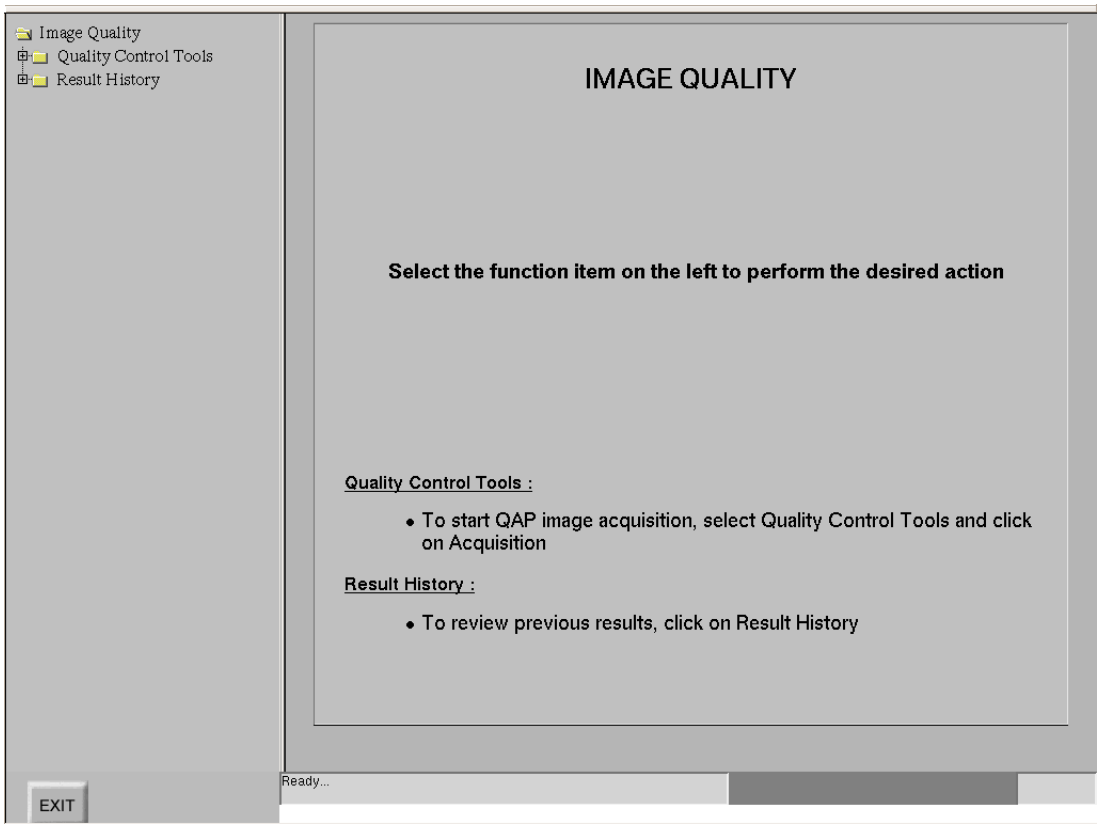
Image Quality
Quality Control Tools
Result History
IMAGE QUALITY
Select the function item on the left to perform the desired action
Quality Control Tools :
To start QAP image acquisition, select Quality Control Tools and click on Acquisition
Result History :
To review previous results, click on Result History
EXIT
Ready...

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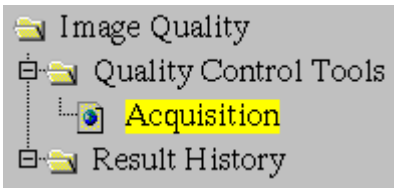
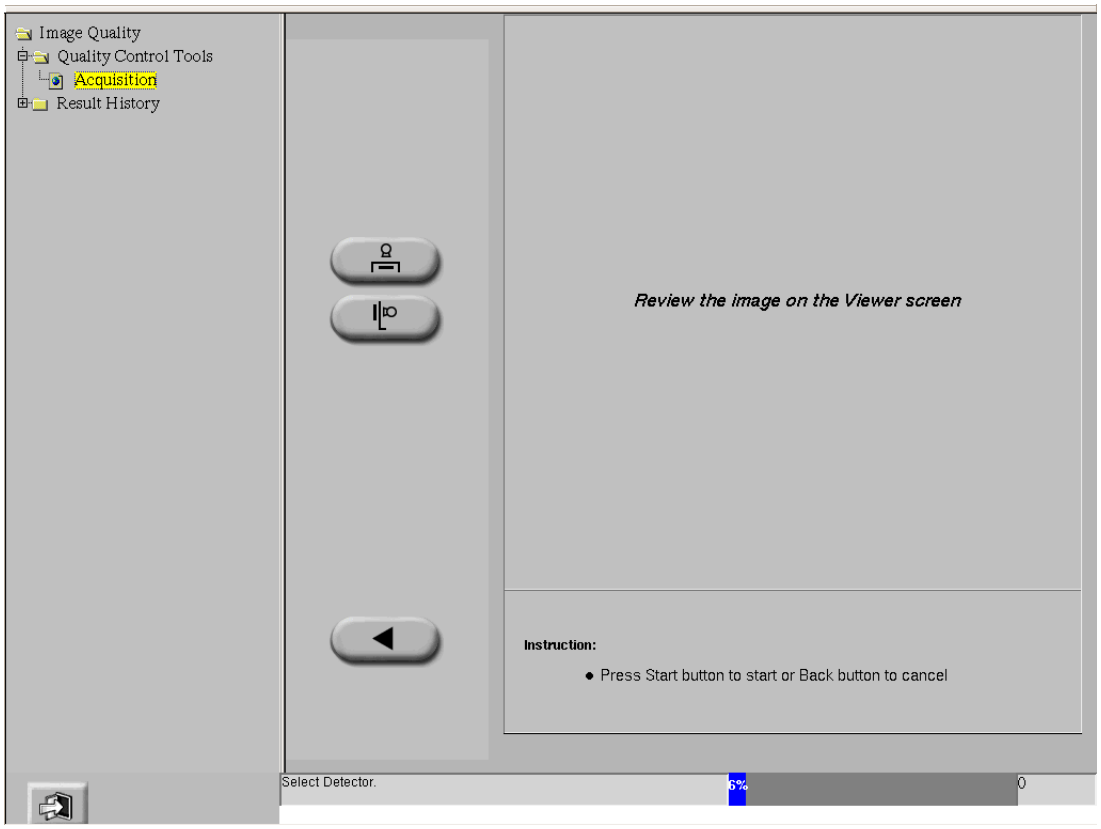
2. From left pane, open **Quality Control Tools > Acquisition**. (Figure 11-7)

Figure 11-7 Selecting Acquisition



- The Start screen appears (Figure 11-8).

Figure 11-8 Start screen



3. Select the receptor to perform QAP: [START TABLE TEST] or [START WS TEST]. Refer to Table 11-1 for symbols.

- The Flat-field Tests screen appears (Figure 11-9).

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Figure 11-9 Flat-field Tests screen

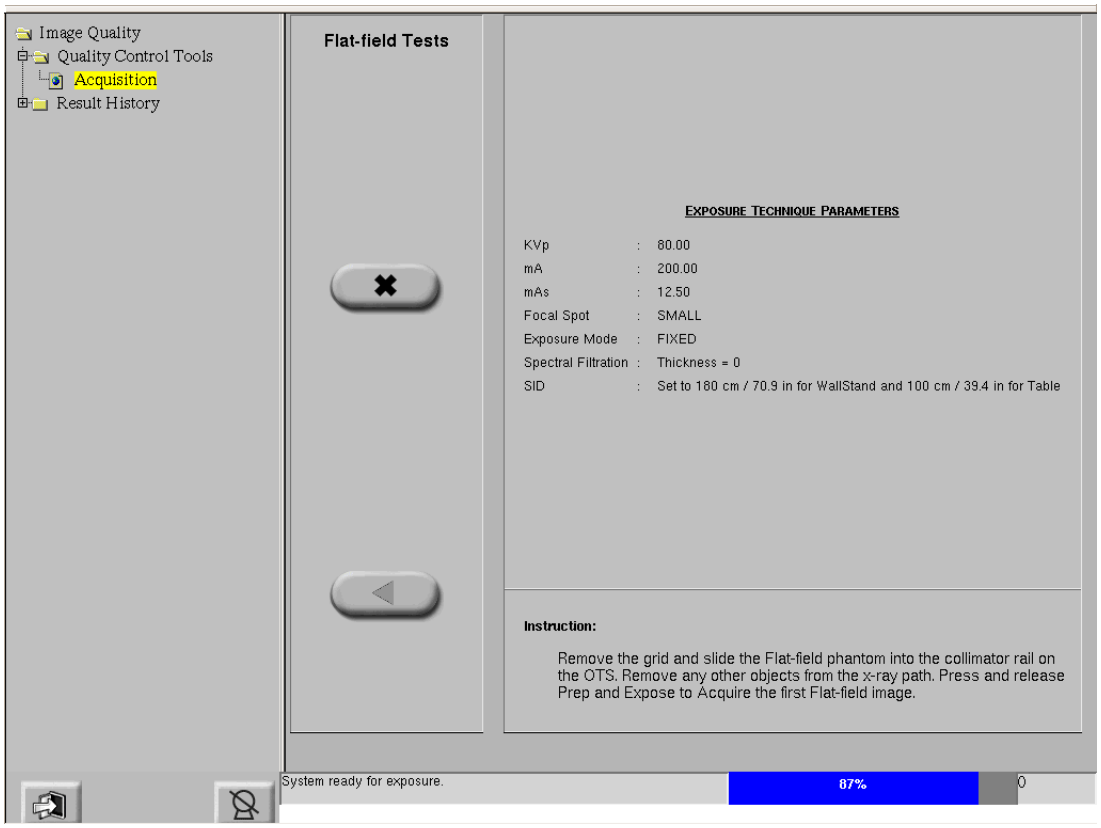
Image Quality
Quality Control Tools
Acquisition
Result History
Flat-field Tests
EXPOSURE TECHNIQUE PARAMETERS
KVp : 80.00
mA : 200.00
mAs : 12.50
Focal Spot : SMALL
Exposure Mode : FIXED
Spectral Filtration : Thickness = 0
SID : Set to 180 cm / 70.9 in for WallStand and 100 cm / 39.4 in for Table
Instruction:
Remove the grid and slide the Flat-field phantom into the collimator rail on the OTS. Remove any other objects from the x-ray path. Press and release Prep and Expose to Acquire the first Flat-field image.
System ready for exposure.
87%
0

4. Follow the instructions at the bottom of the Flat-field Tests screen:
   a) Remove the grid (if necessary)
   b) Insert flat field phantom into the collimator rail.
   c) Remove any objects from the x-ray path.
   d) Prep and Expose the flat-field phantom.
5. Wait for the exposure sequence to complete.
   - The phantom image appears on the right monitor (Figure 11-10).

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Figure 11-10 Flat-field phantom image

6. Prep and Expose the flat-field phantom again.
   - The Composite Tests screen appears (Figure 11-11).

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Figure 11-11 Composite Tests screen

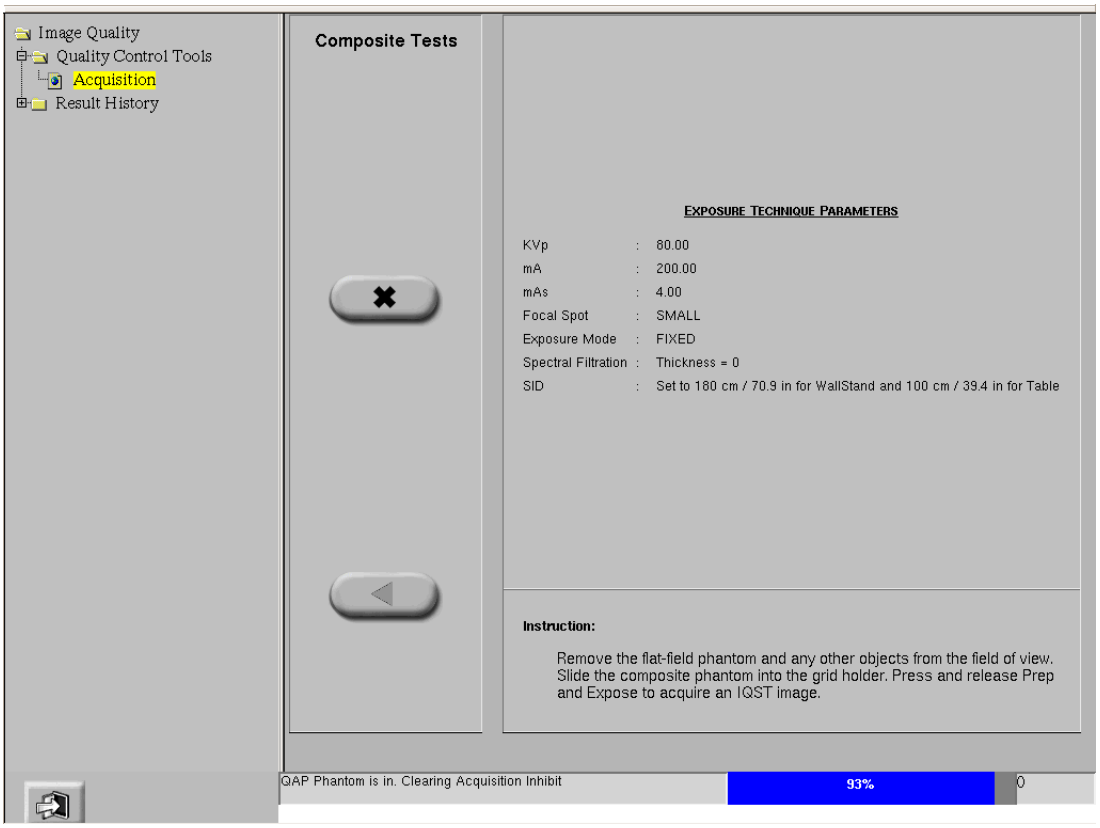
Image Quality
Quality Control Tools
Acquisition
Result History
Composite Tests
EXPOSURE TECHNIQUE PARAMETERS
KVp : 80.00
mA : 200.00
mAs : 4.00
Focal Spot : SMALL
Exposure Mode : FIXED
Spectral Filtration : Thickness = 0
SID : Set to 180 cm / 70.9 in for WallStand and 100 cm / 39.4 in for Table
Instruction:
Remove the flat-field phantom and any other objects from the field of view. Slide the composite phantom into the grid holder. Press and release Prep and Expose to acquire an IQST image.
QAP Phantom is in. Clearing Acquisition Inhibit
93%
0

7. Follow the instructions at the bottom of the Composite Tests screen:
   a) Remove the flat-field phantom an any other objects from the field of view.
   b) Insert the composite phantom into the grid holder.
   c) Prep and Expose the composite phantom.
      – The phantom image appears on the right monitor (Figure 11-12).
      – The Start screen appears.

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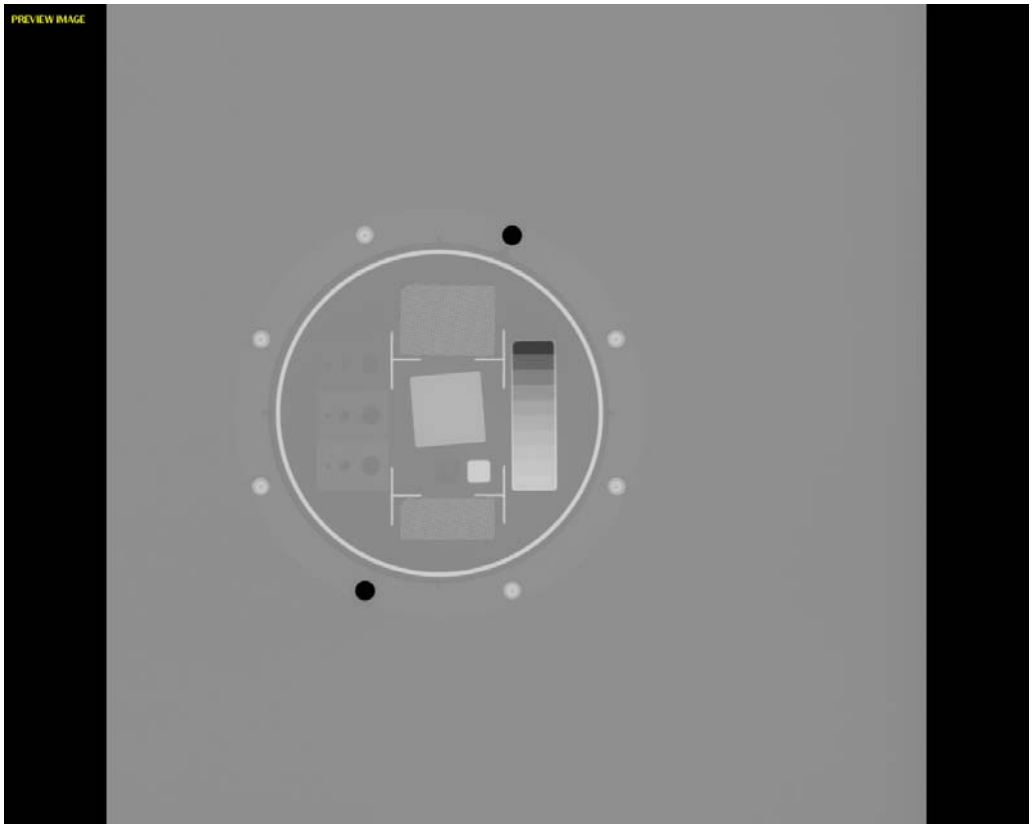
Figure 11-12 Composite phantom image



8. Select the other receptor.
9. Repeat process for the other receptor.
   - The QAP Results screen appears (Figure 11-13).
10. Review the Overall Result: PASS or FAIL
    - If PASS: QAP is complete. Click [EXIT] to return to the Worklist screen.
    - If FAIL: Refer to *Failed QAP* (p. 11-11) for more information.
11. Log off and perform a controlled shutdown and start up. Refer to *Chapter 9: General Information-System Start Up and Shut Down* (p. 9-2) for more information.

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Figure 11-13 QAP Results screen

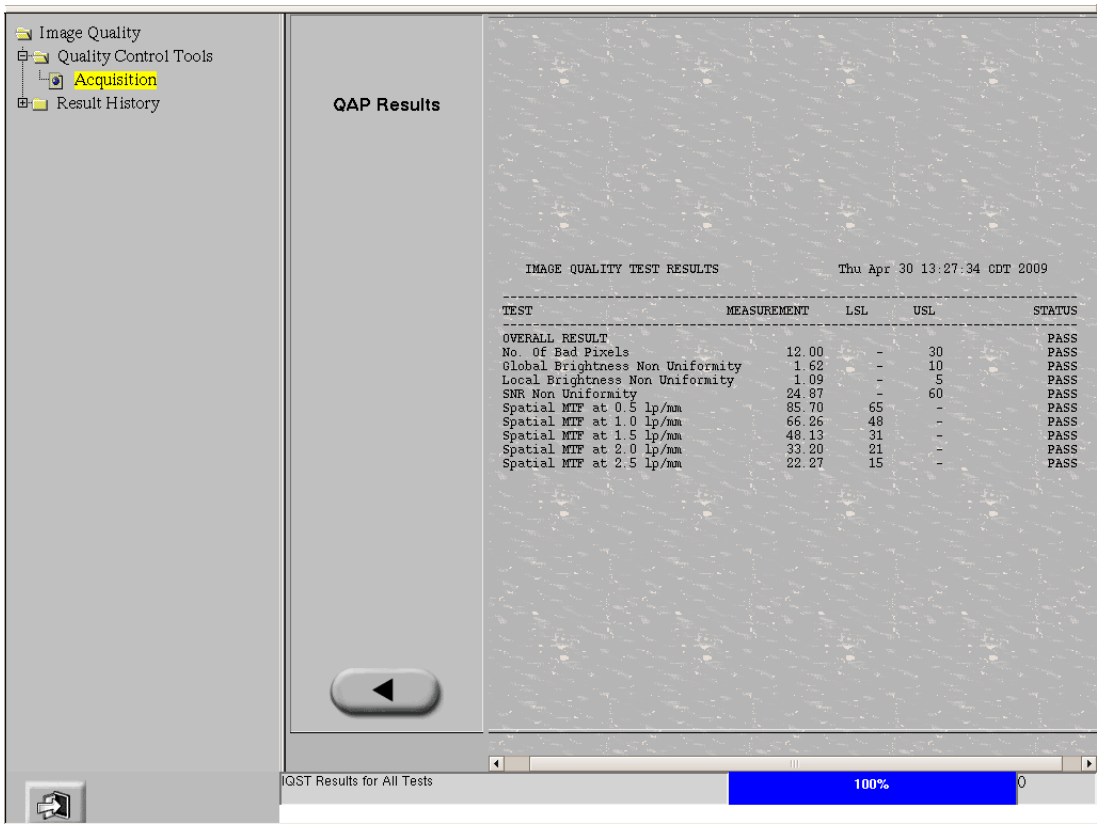
Image Quality
Quality Control Tools
Acquisition
Result History
QAP Results
IMAGE QUALITY TEST RESULTS
Thu Apr 30 13:27:34 CDT 2009
TEST MEASUREMENT LSL USL STATUS
OVERALL RESULT PASS
No. Of Bad Pixels 12.00 - 30 PASS
Global Brightness Non Uniformity 1.62 - 10 PASS
Local Brightness Non Uniformity 1.09 - 5 PASS
SNR Non Uniformity 24.87 - 60 PASS
Spatial MTF at 0.5 lp/mm 85.70 65 - PASS
Spatial MTF at 1.0 lp/mm 66.26 48 - PASS
Spatial MTF at 1.5 lp/mm 48.13 31 - PASS
Spatial MTF at 2.0 lp/mm 33.20 21 - PASS
Spatial MTF at 2.5 lp/mm 22.27 15 - PASS
IQST Results for All Tests
100%
0

Failed QAP

NOTE: In the event of a failed QAP test, repeat the QAP procedure to confirm the failure. This section identifies common problems to check.

If a single failure is confirmed, call to schedule service. The system is operational, although inspection and potential calibration are needed.

If multiple failures are confirmed, image quality may be effected; cease use of the unit and call for immediate service.

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Figure 11-14 Failed QAP results

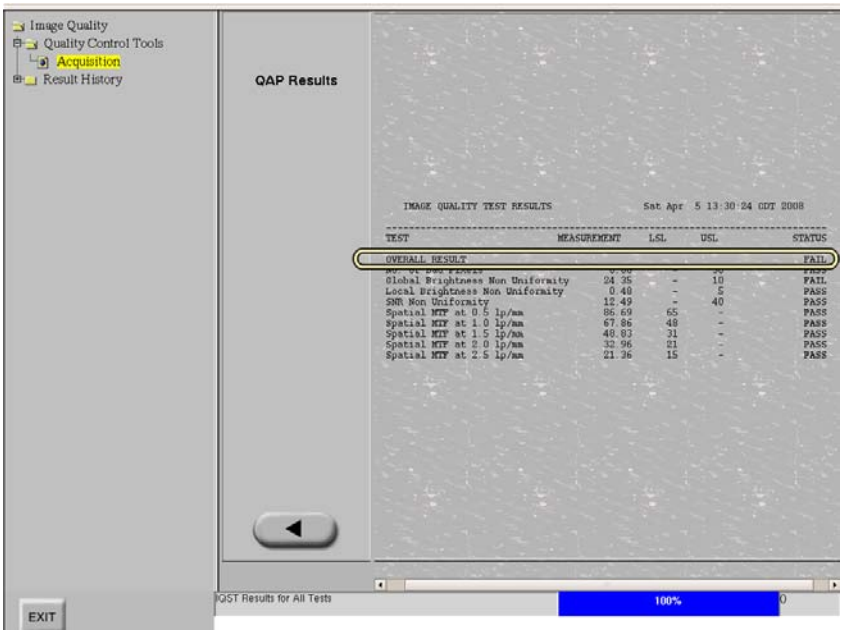
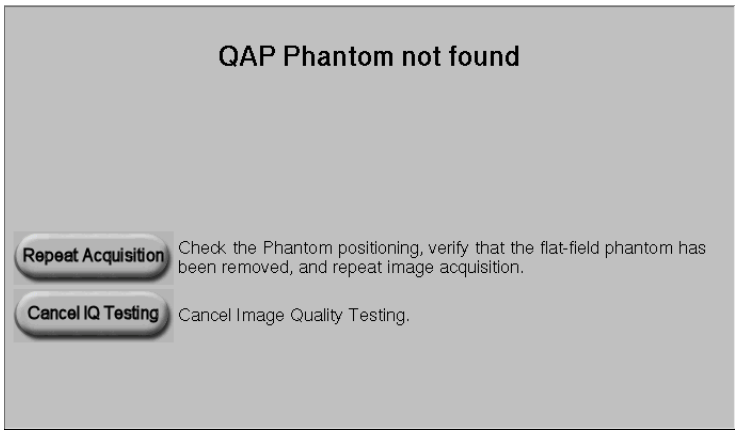


Image Quality
Quality Control Tools
Acquisition
Result History
QAP Results
IMAGE QUALITY TEST RESULTS
Sat Apr 5 13:30:24 CDT 2008
TEST
MEASUREMENT
LSL
USL
STATUS
OVERALL RESULT
FAIL
Global Brightness Non Uniformity 24.35 - 10 FAIL
Local Brightness Non Uniformity 0.40 - 5 PASS
SNR Non Uniformity 12.49 - 40 PASS
Spatial MTF at 0.5 lp/mm 86.69 65 - PASS
Spatial MTF at 1.0 lp/mm 67.86 48 - PASS
Spatial MTF at 1.5 lp/mm 48.83 31 - PASS
Spatial MTF at 2.0 lp/mm 32.96 21 - PASS
Spatial MTF at 2.5 lp/mm 21.36 15 - PASS
IQST Results for All Tests
100%
EXIT

The system prompts you if the QAP test has failed and indicates which portion was affected by displaying messages. The following list provides information to correct the problem.

- If the flat-field tests fail, check the collimator blade position and make sure they are fully open, i.e. the collimator blades are not in the field of view.
- If the composite phantom tests fails, a message appears (Figure 11-15).

Figure 11-15 QAP Phantom not found message


QAP Phantom not found
Repeat Acquisition
Check the Phantom positioning, verify that the flat-field phantom has been removed, and repeat image acquisition.
Cancel IQ Testing
Cancel Image Quality Testing.

- Check that the flat-field phantom is not in the collimator rail.
- Check that the tube and detector are vertically aligned.
- Check that the composite phantom is inserted completely into the grid holder.

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Result History

Follow this process to view the results of previous QAP tests.

1. From the left pane, double-click Result History.
   - The Result History screen appears.
2. Click on a test entry in the list to select it.
3. Click [SELECT].
   - The test details appear.

Figure 11-16 Result History

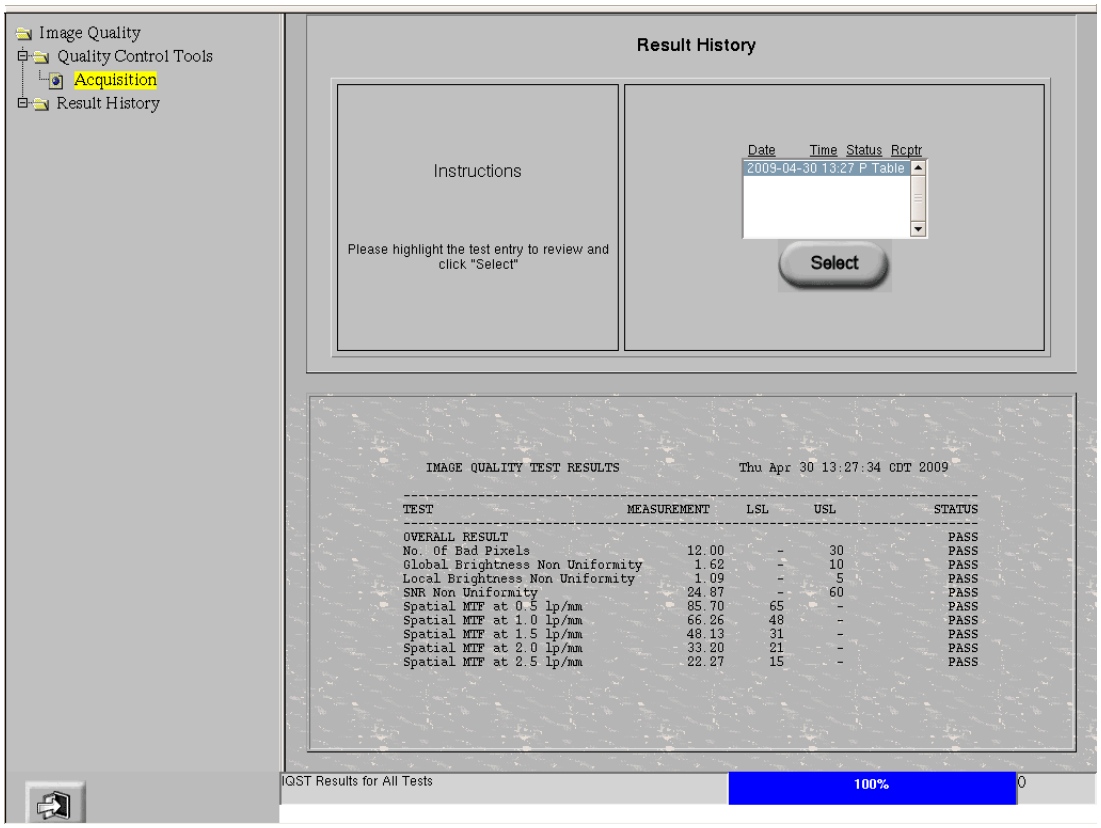
Image Quality
Quality Control Tools
Acquisition
Result History
Result History
Instructions
Please highlight the test entry to review and click "Select"
Date Time Status Rcptr
2009-04-30 13:27 P Table
Select
IMAGE QUALITY TEST RESULTS Thu Apr 30 13:27:34 CDT 2009
TEST MEASUREMENT LSL USL STATUS
OVERALL RESULT PASS
No. Of Bad Pixels 12.00 - 30 PASS
Global Brightness Non Uniformity 1.62 - 10 PASS
Local Brightness Non Uniformity 1.09 - 5 PASS
SNR Non Uniformity 24.87 - 60 PASS
Spatial MTF at 0.5 lp/mm 85.70 65 - PASS
Spatial MTF at 1.0 lp/mm 66.26 48 - PASS
Spatial MTF at 1.5 lp/mm 48.13 31 - PASS
Spatial MTF at 2.0 lp/mm 33.20 21 - PASS
Spatial MTF at 2.5 lp/mm 22.27 15 - PASS
IQST Results for All Tests
100%

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Maintenance

It is the owners responsibility to provide regular periodic maintenance and service. Only this type of maintenance program can identify potential problems.

Periodic Maintenance

Periodic maintenance is required for continued SAFE operation. Periodic maintenance should be performed as specified in the maintenance schedule of the service manual by qualified personnel. Descriptions and scheduled frequency of the required periodic maintenance are provided in the Service CD-ROM (5137441-200) supplied with the equipment. Inspection intervals are based on average daily use of one eight hour shift. More frequent inspection is appropriate where equipment use is above average.

CAUTION: Failure to perform the periodic inspection and maintenance could allow deteriorating conditions to develop without being detected. This deterioration could result in equipment failures, which could cause serious injury or equipment damage.

X-ray Generator Specifications

The X-ray generator power requirements, operational kVp, mA ratings and specifications are provided in the Service CD-ROM (5137441-200).

X-ray Tube Ratings

X-ray tube physical specifications, radiographic tube rating curves, and target protection curve directions are also provided in the Service CD-ROM (5137441-200).

Qualified Service

Safe equipment performance requires the use of service personnel specially trained on medical X-ray apparatus. General Electric Medical Systems and its associates, maintain a world-wide organization of stations from which to furnish periodic and/or emergency service on a contract basis. A GE representative will be glad to discuss this plan. General Electric Medical Systems X-ray equipment contains operating safeguards designed to provide maximum safety. Before calling for service, be certain proper operating procedures are being used.

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Cleaning and Disinfecting

This equipment should be cleaned frequently, particularly if corroding chemicals are present. Use a cloth moistened in warm soapy water (use mild soap) to clean the trim and nameplate of the Operator's Controls. Wipe with a cloth moistened in clean water. Do not use cleaners or solvents of any kind as they may dull the finish or blur the lettering. Polish with a pure liquid or paste wax. Other surfaces of the equipment can be cleaned using a clean cloth moistened slightly with a good mild cleaner and polish acceptable for use on enameled metal surfaces. Before each use, equipment surfaces that contact the patient should be cleaned with an EPA registered, low-level disinfection or sanitizing agent.

CAUTION: In the event of equipment contacting broken skin or being used with infected or immune compromised patients, the equipment should be cleaned using EPA cleared and EPA registered high-level disinfecting agents.

NOTE: Be sure to follow the label instructions and pre-cautions for use, storage, and disposal of all disinfecting agents.

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Chapter 12
Set Preferences

Preferences allow a super-user to customize the system. This chapter explains the Preferences available to you and how to activate or change the preferences for your facility, such as:

- Predefine X-ray procedure parameters so that any stored procedure may be retrieved from memory, allowing you to access technique factors programmed for that type of procedure.
- Enable automatic networking and printing features.
- Customize system default annotations and image orientation.
- Create preferences for image processing.
- Save commonly used operator and physician names in your system for later recall.

Preferences are set on the Utilities screen (Figure 12-1), which is accessed by clicking the [UTILITIES] button on the Worklist.

Refer to *Chapter 13: Advanced Applications and Options* for information about setting preferences specific to Dual Energy, Image Pasting, Auto Positioning, and Orthopedic Magnification.

Topics covered include:

- *System* (p. 12-3)
  - *Network Connections* (p. 12-3)
    - *Add or Edit Network Host* (p. 12-4)
    - *Remove Network Host* (p. 12-7)
    - *Perform C-Echo Test* (p. 12-8)
  - *Printers* (p. 12-8)
    - *Add or Edit DICOM Printers* (p. 12-9)
    - *Remove Printer* (p. 12-12)
- *Worklist* (p. 12-13)
  - *Default Query* (p. 12-13)
    - *Auto Refresh* (p. 12-15)
  - *Preset Names* (p. 12-15)
    - *Add Preset Names* (p. 12-16)
    - *Edit Preset Names* (p. 12-16)
    - *Remove Preset Names* (p. 12-17)

(continued on the next page)

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(continued from the previous page)

- *Image Management* (p. 12-17)
  - *Copy Exam* (p. 12-18)
  - *Auto Tag (Quality Check)* (p. 12-18)
  - *Auto Print* (p. 12-18)
  - *Auto Send (Auto Push)* (p. 12-23)
  - *Auto Delete* (p. 12-24)
- *Image Viewer* (p. 12-26)
  - *Pre-set Annotations* (p. 12-27)
    - *Add Pre-set Annotation* (p. 12-27)
    - *Edit Pre-set Annotation* (p. 12-28)
    - *Remove Pre-set Annotation* (p. 12-28)
- *DEI (Detector Exposure Indicator)* (p. 12-29)
  - *Change the DEI Display* (p. 12-30)
  - *Change the Lower and Upper Limits* (p. 12-31)
  - *Enable or Disable Technical Mode* (p. 12-31)
  - *Export the DEI Log* (p. 12-31)
- *Exam* (p. 12-32)
- *Image Processing* (p. 12-32)
  - *Change Default Factory Looks for Exams* (p. 12-33)
  - *Build Custom Looks* (p. 12-34)
    - *Change Image Processing from the Viewer* (p. 12-37)
  - *Tissue Equalization Overview* (p. 12-38)
    - *TE Usage* (p. 12-39)
    - *TE Parameters* (p. 12-39)
- *Protocols* (p. 12-42)
  - *Backup Protocol Database to CD* (p. 12-42)
  - *Retrieve Protocol Database from CD* (p. 12-43)
  - *Edit Protocol Database* (p. 12-44)
    - *Add or Edit Category* (p. 12-45)
    - *Add or Edit Exam* (p. 12-46)
    - *Add or Edit View* (p. 12-47)
  - *Protocol Editor Copy Functions* (p. 12-52)
    - *Copy Category* (p. 12-53)
    - *Copy Exam* (p. 12-53)
    - *Copy View* (p. 12-54)
- *VolumeRAD* (p. 12-54)

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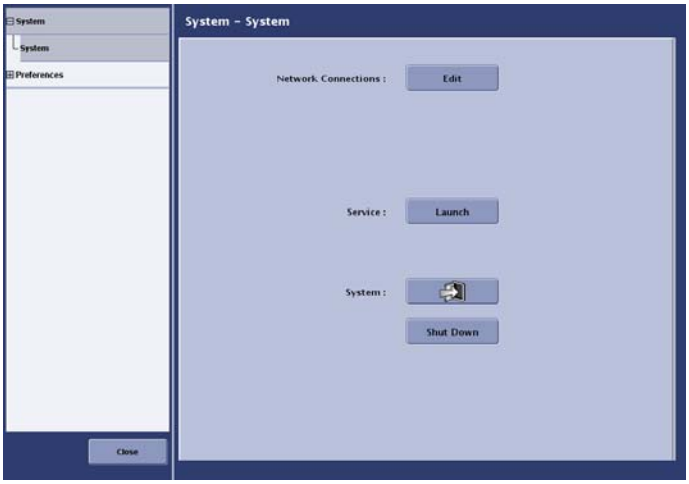
System

This section provides instructions for setting your system preferences for network and printer connections. The Services Desktop, Log Off, and Shut Down functions are also available from this screen. Refer to *Chapter 9: General Information* for more information about logging off and Shut Down.

Figure 12-1 System Utilities screen



Network Connections

Network and printer connections are configured through the Utilities System-System screen. This screen allows qualified service personnel to define the Digital Imaging and COmmunication in Medicine (DICOM) send destinations.

Network connections may be added, removed, or edited from this screen.

Follow this process to access the Network Connections screen.

1. On the Worklist screen, click [UTILITIES].
   - The System-System screen appears.
2. Click [NETWORK CONNECTIONS].
   - The Network Connections screen (Figure 12-2) appears.

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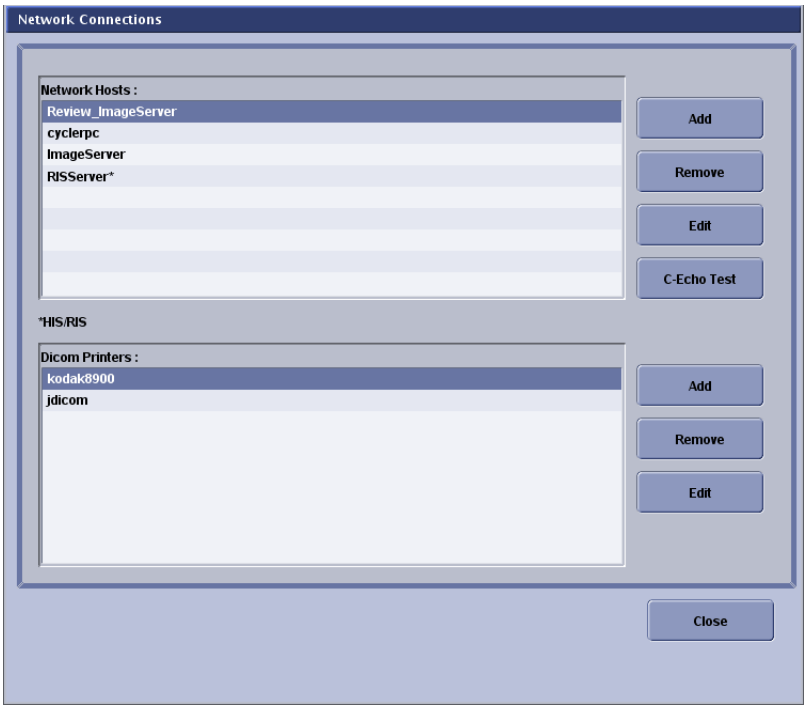
Figure 12-2 Network Connections screen



Add or Edit Network Host

Adding and editing network hosts use very similar process and the same screens as shown in Figure 12-3 and Figure 12-4. Table 12-1 and Table 12-2 describe the fields in detail.

- If editing an existing connection, select the network host and click [EDIT].
- If adding a new connection, click [ADD].

Complete requested information for both tabs and click [SAVE] to add the network host or save the changes.

Figure 12-3 Add Network Host – Host tab

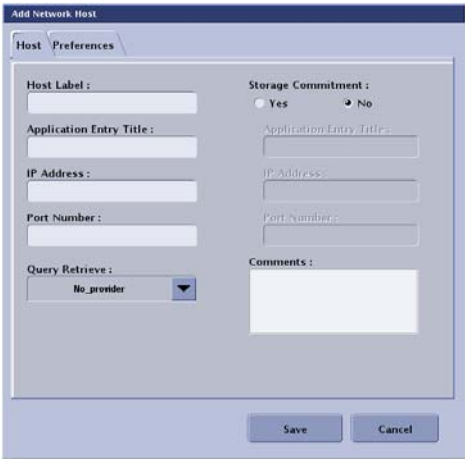


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Table 12-1 Add Network Host – Hosts tab description

Function	Description
Host Label	The name of the host that appears in the Network Hosts lists and on the Image Management screen. **NOTE:** Host labels cannot have spaces in the name. Use underscores (_) to separate words.
Application Entry Title	The DICOM application title.
IP Address	The IP address of the network host.
Port Number	The port number for the network host.
Query Retrieve	Sets the type of information the host will provide on query from another host. Available options are: • No provider • Study • Patient
Storage Commitment	Designates if the host will store image data.
Storage Commitment - Application Entry Title	The DICOM application title.
Storage Commitment -IP Address	The IP address of the storage database.
Storage Commitment -Port Number	The port number of the storage database.
Comments	Allows you to add notes about the network host or configuration.

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Figure 12-4 Add Network Host – Preferences tab

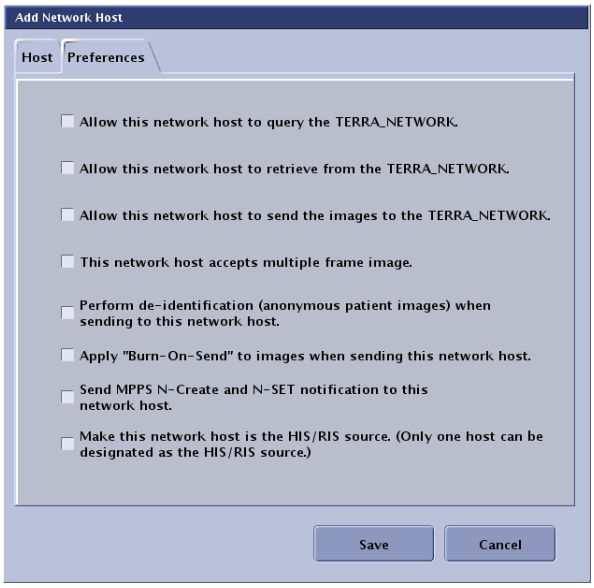
Add Network Host
Host
Preferences
Allow this network host to query the TERRA_NETWORK.
Allow this network host to retrieve from the TERRA_NETWORK.
Allow this network host to send the images to the TERRA_NETWORK.
This network host accepts multiple frame image.
Perform de-identification (anonymous patient images) when sending to this network host.
Apply "Burn-On-Send" to images when sending this network host.
Send MPPS N-Create and N-SET notification to this network host.
Make this network host is the HIS/RIS source. (Only one host can be designated as the HIS/RIS source.)
Save
Cancel

Table 12-2 Add Network Host – Preferences tab description

Function	Description
Allow this host to query the (Definium 8000 system name)	Allows this host to search and filter the Definium 8000 system.
Allow this host to retrieve from the (Definium 8000 system name)	Allows this host to open and display exams from the Definium 8000 system.
Allow this host to send images to the (Definium 8000 system name)	Allows the host to send images to the Definium 8000 system.
This network host accepts multiple frame image.	Allows multiple frame images to be send to this network host.
Perform de-identification (anonymous patient images) when sending to this network host.	Automatically de-identifies any images that the Definium 8000 system sends to this host. Refer to *Chapter 8: Image Management-Make Patient Anonymous (De-Identify)* (p. 8-14) for more information about de-identification.

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Function	Description
Apply "Burn-On-Send" to images when sending to this network host.	Burns the VOI LUT (Look-Up Tables) into the DICOM header to be displayed by PACS. Leaving his option unselected sends all available VOI LUTs to the DICOM header for PACS to query and apply. **NOTE:** PACS should be configured to read the first VOI LUT for proper display of images on the Acquisition workstation.
Send MPPS N-Create and N-Set notification to this network host.	This node acts as the Destination for receiving the MPPS N-Create & N-Set Notification. When configured for MPPS, the System sends information like which exam is in progress, when a Study is completed, how many images were acquired, and what was the radiation dose to which the patient was exposed during that session, etc.
Make this host the HIS/RIS source. (Only one host can be designated as the HIS/RIS source.)	Designates the host as the DICOM Worklist provider. Defining the Radiology Information System (RIS) and Hospital Information System (HIS) host allows you to download patient Worklists from those networks to your system. **NOTE:** Only one HIS/RIS source may be designated on the system. Selecting this option will de-select any other hosts as the HIS/RIS source.

Remove Network Host

Follow this process to remove a network host.

1. From the Network Connections screen, select the network host.
2. Click [REMOVE].
   - A message appears: "Are you sure you want to remove (host name)?"
3. Click [YES].
   - [CANCEL] closes the message and returns you to the Network Connections screen without removing the connection.
   - The network host is removed.

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Perform C-Echo Test

Use this function when you want to check to see if the system is communicating with a particular network host.

1. Select a host from the Network Hosts list.
2. Press [C-ECHO TEST].
   - A message appears to notify you if the test passed or failed.
   - A “passed” message means that the network host is working and that you can retrieve exams from it or transfer exams to it.

Failed C-Echo Test

A “failed” message means that the system could not contact the network host.

Perform the following tasks to resolve the problem.

- Re-try the test at a later time. The host may be temporarily unavailable.
- Confirm the host configuration on the Edit screen.

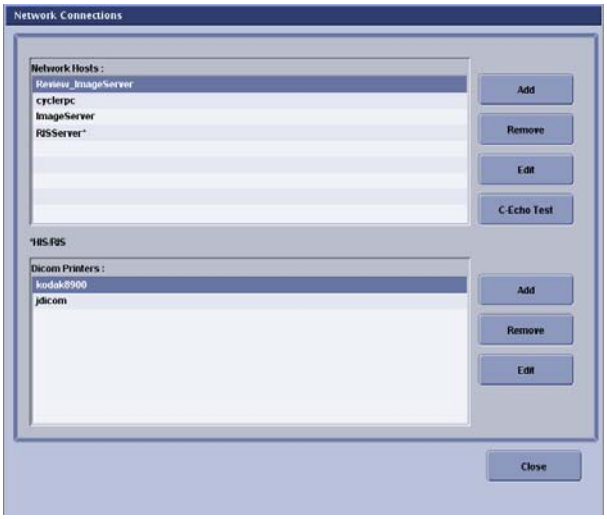
If the problem persists, contact your technical support group or system administrator.

Printers

Follow this process to access the Network Connections screen.

1. On the Worklist screen, click [UTILITIES].
   - The System-System screen appears.
2. Click [NETWORK CONNECTIONS].
   - The Network Connections screen (Figure 12-5) appears.

Figure 12-5 Network Connections screen



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Add or Edit DICOM Printers

Adding and editing printers use very similar process and the same screens shown in Figure 12-6, Figure 12-7, and Figure 12-8. Table 12-3, Table 12-4, and Table 12-5 describe the fields in detail.

- If Editing an existing printer's configuration, select the printer from the DICOM Printers list and click [EDIT].
- If adding a new printer, click [ADD].

Complete requested information for all tabs and click [SAVE] to add the printer or save the changes.

Figure 12-6 Add Printer screen – Printer Tab

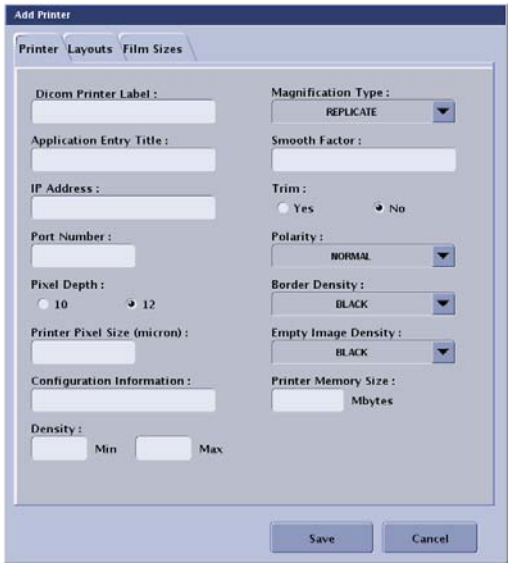

Table 12-3 Add Printer screen– Printer Tab description

Function	Description
DICOM Printer Label	The name of the printer that appears in the DICOM Printers list and on the print setup screens. **NOTE:** DICOM printer labels cannot have spaces in the name. Use underscores (_) to separate words.
Application Entry Title	The DICOM application title.
IP Address	The IP address of the printer.
Port Number	The port number of the printer.
Pixel Depth	The resolution of the printer.

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Function	Description
Printer Pixel Size (micron)	Designates the pixel size the printer uses. This is specified by the printer manufacturer.
Configuration Information	A place for you to add notes about the printer or configuration.
Density	Sets the minimum and maximum density range.
Magnification Type	Available options are: • Replicate • Bilinear • Cubic • None
Smooth Factor	Sets the image smoothing factor.
Trim	Designates if there is to be trim or not.
Polarity	Available options are: • Normal • Reverse
Border Density	Sets the color of the image border. Available options are: • Black • White
Empty Image Density	Sets the color of areas that have no image printed. Available options are: • Black • White
Printer Memory Size	Designates the memory size of the printer. This is specified by the printer manufacturer.

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Figure 12-7 Add Printer screen – Layouts tab

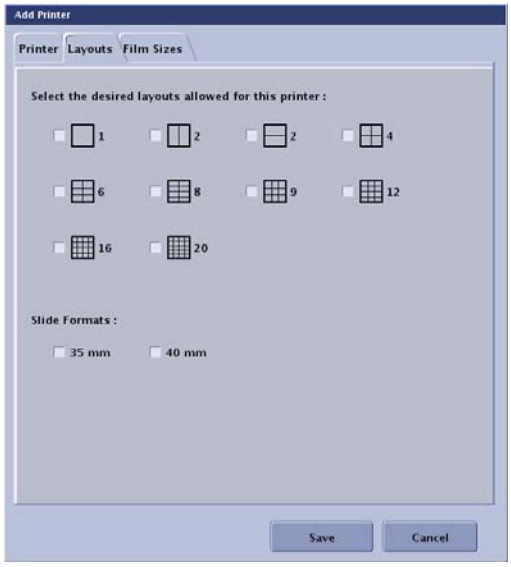

Table 12-4 Add Printer screen– Layouts Tab description

Function	Description
Select the desired layouts allowed for this printer	Selections allow the number of images that may be printed on a single sheet of film or paper. Some selections control the orientation of the images on the page: for example, 2 images per page may be side by side or one on top of the other.
Slide formats	Selections allow the side formats available for the printer, if any.

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Figure 12-8 Add Printer – Film Sizes tab

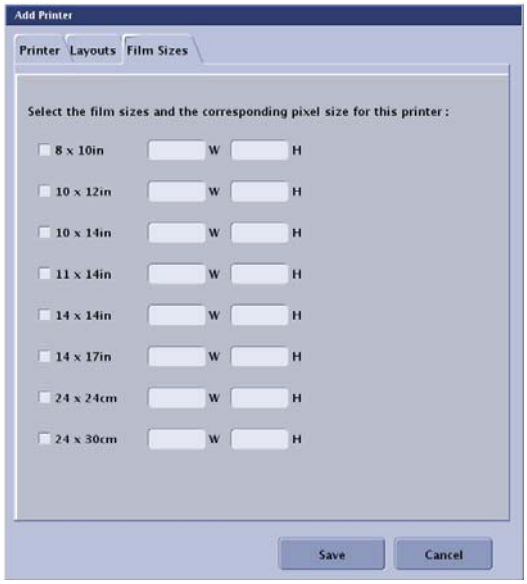

Table 12-5 Add Printer screen– Film sizes description

Function	Description
Film sizes (8 x 10in)	Selects the sizes of film available for the printer.
Pixel size: W (width)	Sets how wide the film is in pixels. This value is provided by the printer manufacturer based on what the printer supports.
Pixel size: H (height)	Sets how high the film is in pixels. This value is provided by the printer manufacturer based on what the printer supports.

Remove Printer

Follow this process to remove a printer.

1. From the Network Connections screen, select the printer.
2. Click [REMOVE].
   - A message appears: “Are you sure you want to remove (printer name)?”
3. Click [YES].
   - [CANCEL] closes the message and returns you to the Network Connections screen without removing the connection.
   - The printer is removed.

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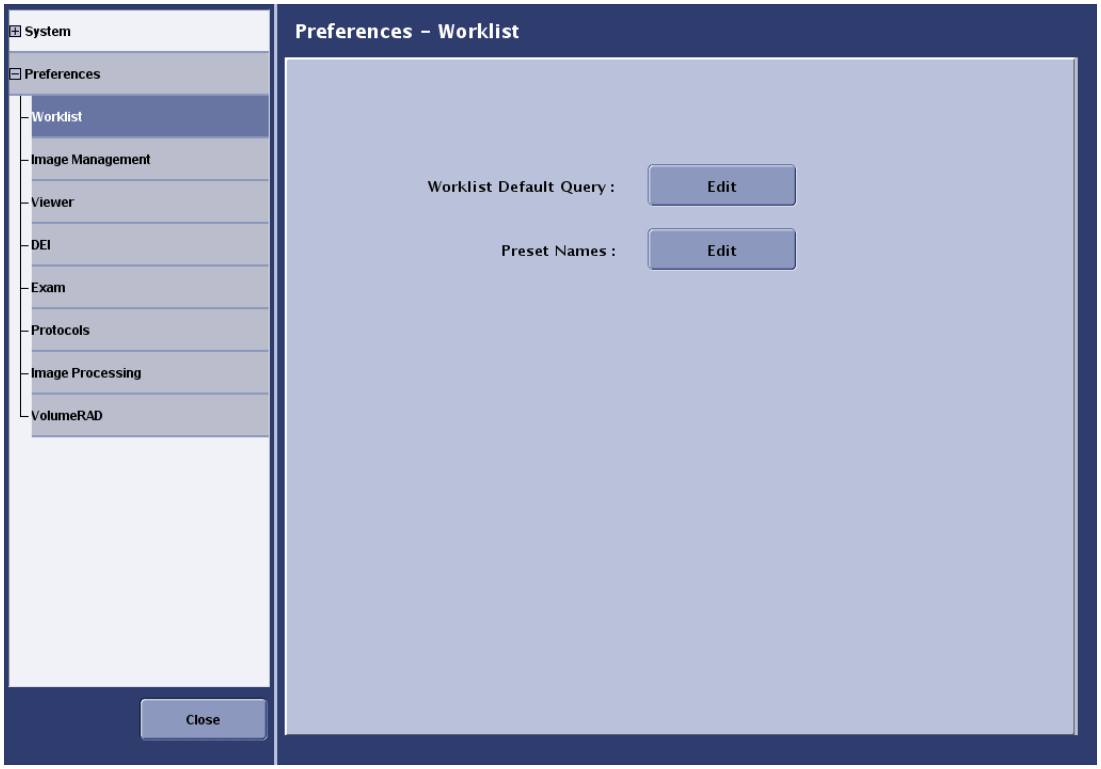
Worklist

Worklist preferences are available from the Utilities screen.

1. On the Worklist screen, click [UTILITIES].
2. Select **Preferences > Worklist**.

Figure 12-9 Preferences – Worklist screen



Default Query

The Worklist Default Query controls the amount of HIS/RIS information that appears on the Worklist and allows you to enable and configure the auto-refresh function.

1. Complete or edit the Worklist Default Query screen (Figure 12-10). Table 12-6 describes the fields in detail.
2. Click [SAVE] to change the Default Query.

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Figure 12-10 Worklist Default Query screen

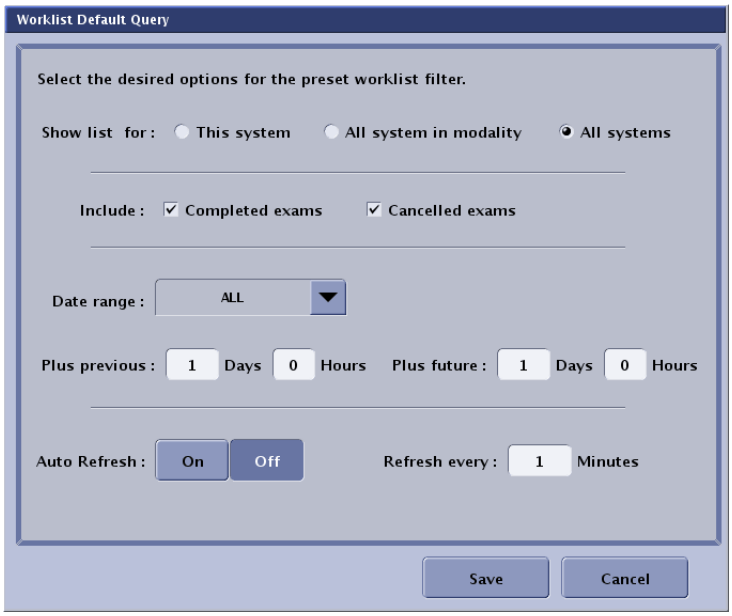

Table 12-6 Worklist Default Query description

Function	Description
Show list for	Determines Worklist items by system or modality. • This system – exams for this unit only • All systems in modality – exams for all digital x-ray • All systems – exams for all modalities
Include	Allows you to include or exclude completed or cancelled exams on the Worklist.
Date Range	Selects the date range of scheduled procedures to show on the Worklist. Available options are: • All • Current Day
Plus previous __ Days __ Hours	Shows procedures that are scheduled for the specified time before the selected date range.
Plus future __ Days __ Hours	Shows procedures that are scheduled for the specified time after the selected date range.

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Function	Description
Auto Refresh [ON] [OFF]	Turns Auto Refresh on or off.
Refresh every __ Minutes	If Auto Refresh is [ON], sets how often (in minutes) the Worklist refreshes. The interval may be between 1 and 9999 minutes.

Auto Refresh

The Worklist Auto-Refresh feature automatically refreshes the Patient Worklist at pre-defined time intervals.

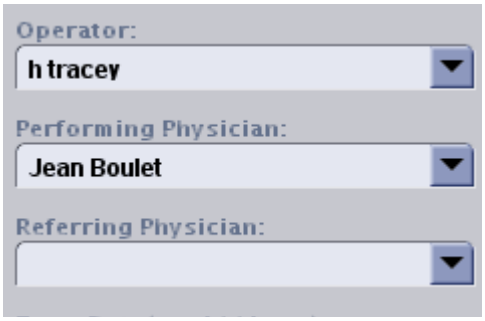
NOTE: You will not be able to make selections or access Worklist functions while the Worklist is refreshing.

NOTE: For large facilities, it is recommended that the auto refresh interval be set to a short time, for example, every 1 or 2 minutes. The system will refresh more often, but each refresh will take less time to complete.

Preset Names

The Preset Names screen (Figure 12-12) allows you to add, remove, or edit the names that appear on the Add Patient/Patient Information screen's Operators, Performing Physicians, and Referring Physicians drop-down lists (Figure 12-11).

Figure 12-11 Drop-down lists on the Add Patient screen



1. Follow the procedures below to Add, Edit, or Remove Preset Names.
2. When finished, click [SAVE] to retain the changes you made.

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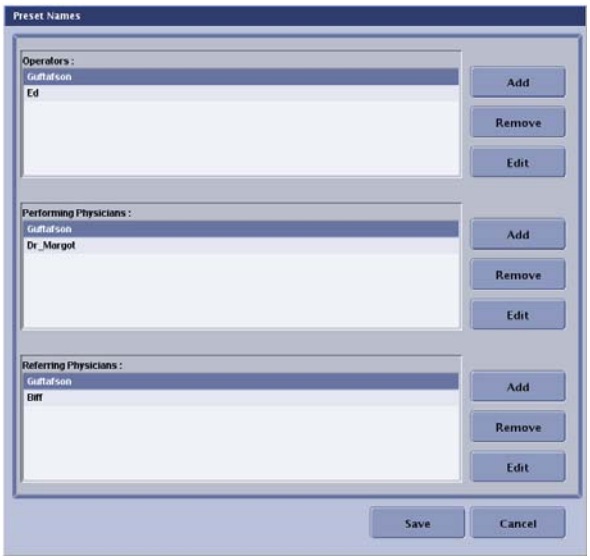
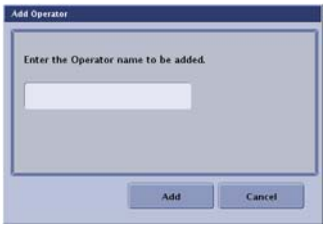
Figure 12-12 Preset Names screen



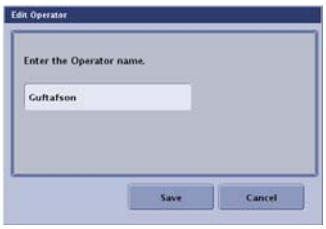
Add Preset Names

1. Click [ADD] for the appropriate group.
2. Type the name to add.
3. Click [ADD].



Edit Preset Names

1. Select the name to change.
2. Click [EDIT] for the group.
3. Edit the name as appropriate.
4. Click [SAVE].



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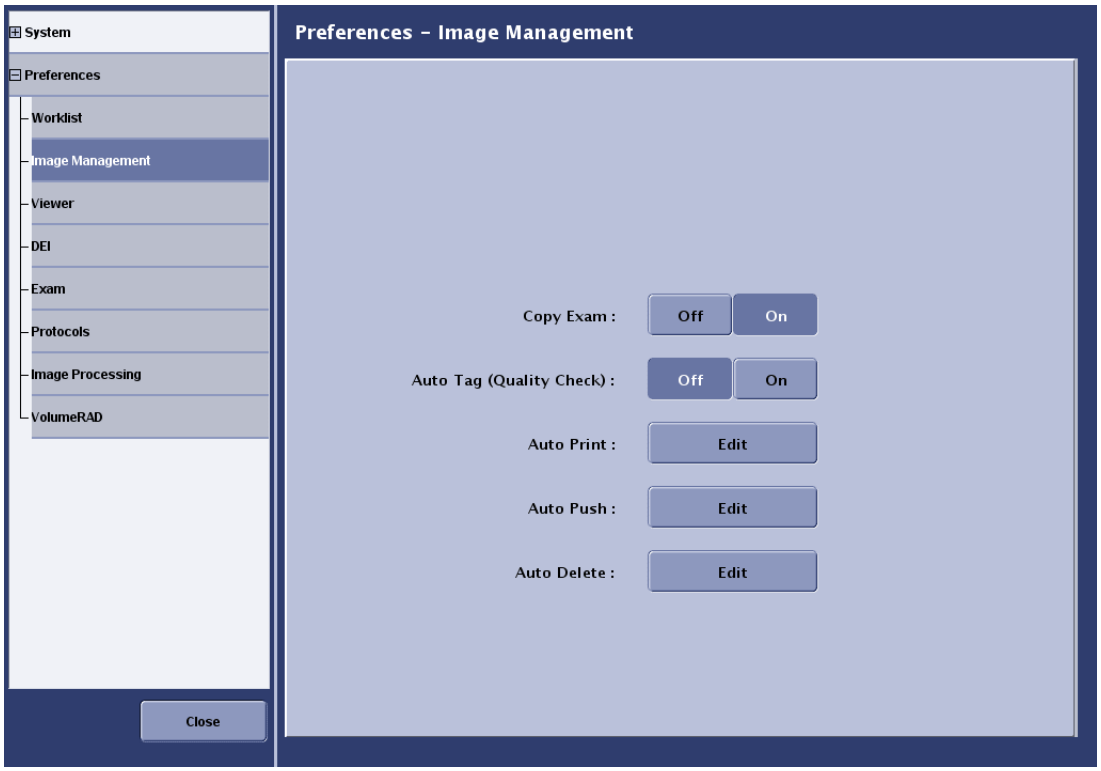
Remove Preset Names

1. Select the name to remove.
2. Click [REMOVE] for the group.
3. Click [OK] to remove the name.
   - Click [NO] to keep the name.

Image Management

Image Management preferences allow you to enable and configure the Copy Exam, Auto Tag, Auto Print, Auto Push, and Auto Delete functions.

Figure 12-13 Preferences – Image Management



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Copy Exam

Enabling the Copy Exam function allows exams to be copied between the local databases and network hosts. It also allows exams to be copied to a CD.

There is no configuration for this function; it is either enabled (ON) or disabled (OFF).

Follow this process to enable or disable Copy Exam:

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Copy Exam [ON] to enable the function.
   - Copy Exam [OFF] disables the function.
4. Click [CLOSE].

Auto Tag (Quality Check)

Enabling Auto Tag (or Quality Check) provides an indicator on the Image Viewer screen to mark an image of acceptable quality. Auto Print and Auto Delete can be configured to act upon images that have the Quality Check mark.

There is no configuration for this function; it is either enabled (ON) or disabled (OFF).

When Auto Tag is set to ON, all images in the series are tagged by default.

Follow this process to enable or disable Auto Tag:

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Tag [ON] to enable the function.
   - Auto Tag [OFF] disables the function.
4. Click [CLOSE].

Auto Print

Default Print/Auto Print (Figure 12-14) allows you to configure your printer parameters. This is done so that you do not need to select all the parameters each time you print an image.

You can select a primary and alternative location as well as how many copies you want each time you print.

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Follow this process to configure Auto Print.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
   - The Default Print/Auto Print screen appears.
4. Complete the information as described in Table 12-7.
5. When finished, click [SAVE] to retain your changes.
6. Click [CLOSE].

Figure 12-14 Auto Print

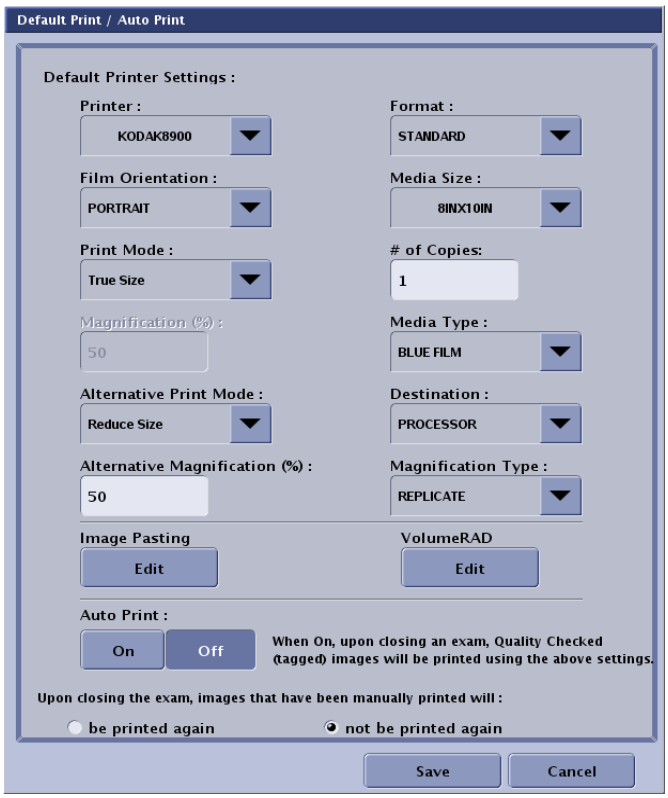

Table 12-7 Auto Print Functions

Function	Description
Printer	Lists the printers and laser cameras connected to your system.

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Function	Description
Film Orientation	Sets if the image will print on the film horizontally or vertically. Available options are: • Portrait – vertical film orientation • Landscape – horizontal film orientation
Print Mode	Provides options on the size of the image data printed. Available options are: • True Size • Fit to Film • Reduced Size
Magnification (%)	If Reduced Size is selected as the Print Mode, allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%. If True Size or Fit to Film are selected as the Print Mode, the text box remains disabled.
Alternate Print mode	Available options are: • Reduce Size • Left/Right Justified • Fit to Film
Alternative Magnification (%)	Allows you to enter an image reduction factor for the secondary printer.
Format	Allows you to choose the formats available for the selected printer. Available options are: • Standard • Slide • Superslide
Media Size	Allows you to choose the size of the media available for the selected printer.
Number of Copies	The Number of Copies text box lets you type in the number of films you wish to print ranging from 1 to 9. The default is one.

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Function	Description
Media Type	Allows you to choose the media types available for the selected printer. Available options are: • Paper • Clear Film • Blue Film
Destination	Allows you to choose the destinations available for the selected printer. Available options are: • Magazine • Processor
Magnification Type	Allows you to choose the magnification types available for the selected printer. Available options are: • Replicate • Bilinear • Cubic • None
Image Pasting [EDIT]	If Image Pasting is enabled, opens a screen to select printing options for pasted composite images. Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more information.
VolumeRAD [EDIT]	If VolumeRAD is enabled, opens a screen to select printing options for VolumeRAD series. Refer to *Appendix A: VolumeRAD™ Auto Printing Preferences* (p. A-34) for more information.
Auto Print [ON] [OFF]	If Auto Tag is enabled, turning Auto Print [ON] will automatically print all images that have the Auto Tag mark when the Image Viewer screen is closed. [OFF] disables the Auto Print function.

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Function	Description
Upon closing the exam, images that have been manually printed will:	Allows the choice to automatically re-print or to not print any images that were printed manually from the Image Viewer screen.
[SAVE]	Saves the current selections and values as the default printing configuration.
[CANCEL]	Closes the Auto Print screen without saving your changes.

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Auto Send (Auto Push)

Auto Send automatically transfers images to another network device when the exam is closed. Auto Send is enabled and configured from the Utilities – Preferences screen.

Follow this process to configure Auto Send.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Push [EDIT].
   - The Auto Send screen appears.
4. Complete the information as described in Table 12-8.
5. When finished, click [SAVE] to retain your changes.

Figure 12-15 Auto Send

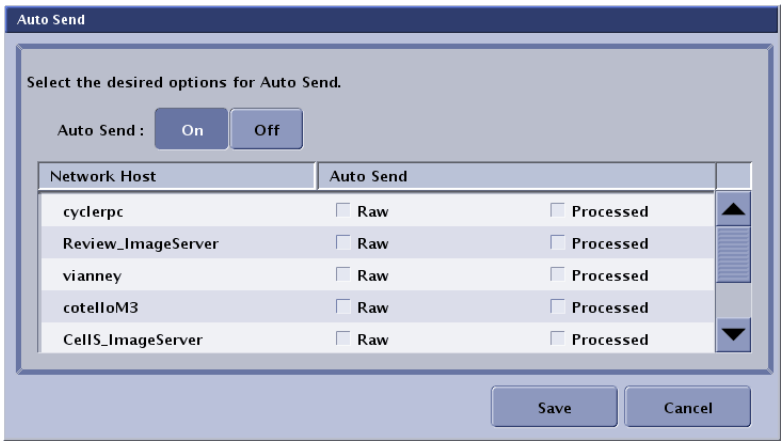

Table 12-8 Auto Send Functions

Function	Description
Auto Send [ON] [OFF]	Turns Auto Send on or off. Selecting On allows you to configure the default Auto Send settings.
Network Host column	Lists the available network locations where images may be transferred. Refer to *Network Connections* (p. 12-3) for information about how to configure the available Network Hosts.

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Function	Description
Auto Send column	Allows you to choose which images are sent to each network host. You may choose either Raw or Processed, both, or none. Leaving both choices unselected means that no images will be sent to the network host.
[SAVE]	Saves your selections as the default settings and closes the Auto Send screen.
[CANCEL]	Closes the screen without saving your changes.

Auto Delete

Auto Delete automatically deletes images when the image database does not have enough space. Auto Delete is enabled from the Utilities – Preferences screen.

Follow this process to configure Auto Delete.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Delete [EDIT].
   - The Auto Delete screen appears.
4. Complete the information as described in Table 12-9.
5. When finished, click [SAVE] to retain your changes.
6. Click [CLOSE].

Figure 12-16 Auto Delete

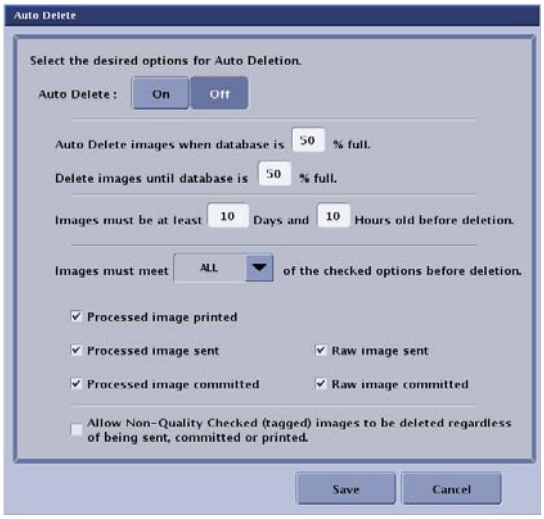

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Table 12-9 Auto Delete functions

Function	Description
Auto Delete [ON] [OFF]	Turns Auto Delete on or off.
Auto Delete images when database is __% full.	Specifies when to auto delete images based on database size.
Delete images until database is __% full.	Specifies how many images to delete based on database size.
Images must be at least __ Days and __ Hours old before deletion.	Specifies how old (in days and hours) an image must be for it to be deleted. Images that are less than the entered number will not be deleted.
Images must meet __ of the checked options before deletion.	Allows you to constrain the deletion of raw and processed images based upon checkbox selection (see below). Available options are: • All • Any • None
Processed image printed	Selecting the Print parameter allows auto deletion of images that have been printed.
Processed image sent	Allows auto deletion of processed images with no errors that have been sent to another viewing station.
Raw image sent	Allows auto deletion of raw images with no errors that have been sent to another viewing station.
Processed image committed	Allows auto deletion of processed images that have been sent to a long term device with storage commitment capability. Storage commitment for a network host is configured from the System – System screen, Network Connections.
Raw image committed	Allows auto deletion of raw images that have been sent to a long term device with storage commitment capability.

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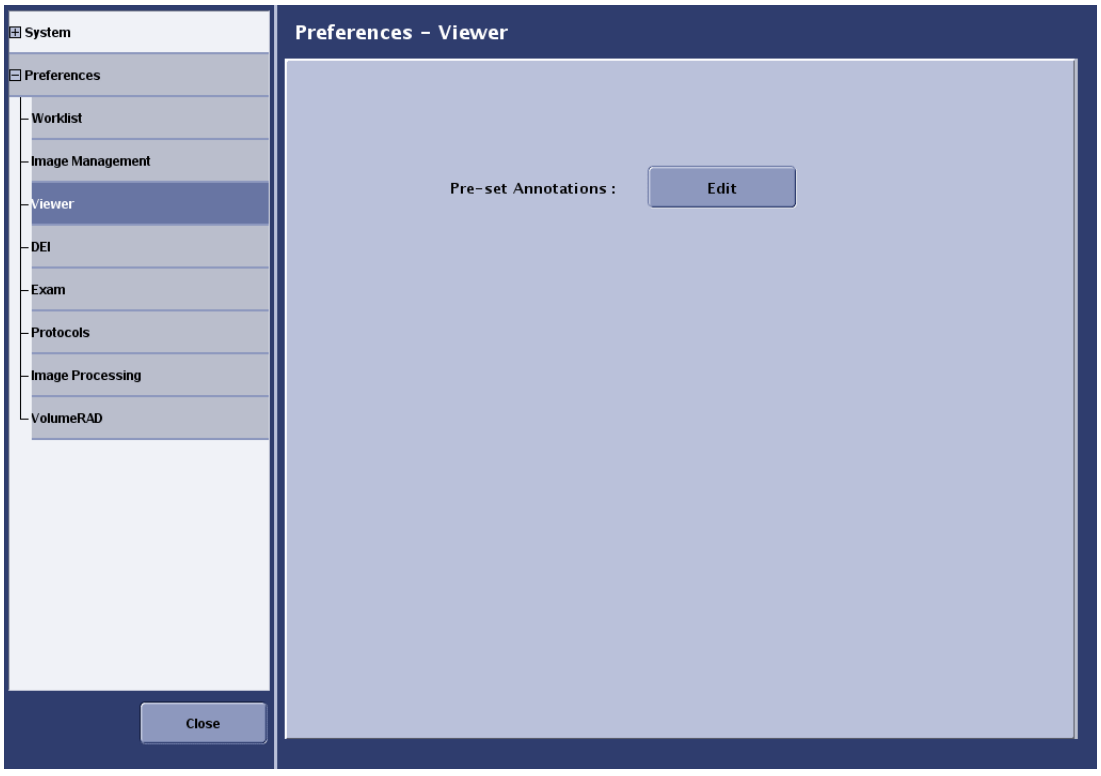
Function	Description
Allow Non-Quality Checked (tagged) images to be deleted regardless of being sent, committed or printed.	Allows auto deletion of any images that do not have the Auto Tag (Quality Check) mark. **NOTE:** If any of the images in the series have the Auto Tag (Quality Check) mark, the series will not auto delete.
[SAVE]	Saves your changes and closes the screen.
[CANCEL]	Closes the screen without saving changes.

Image Viewer

Figure 12-17 Preferences - Viewer screen



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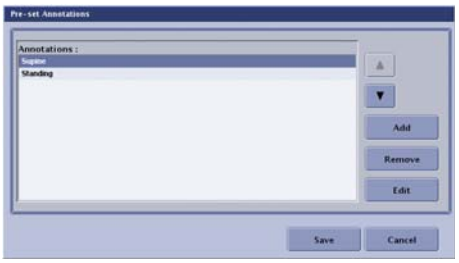
Pre-set Annotations

Viewer Preferences allow you to add, edit, or remove pre-set annotations.

Follow this process to configure pre-set annotations.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Viewer**.
3. Click Pre-set Annotation [EDIT].
   - The Pre-set Annotations editing screen (Figure 12-18) appears.

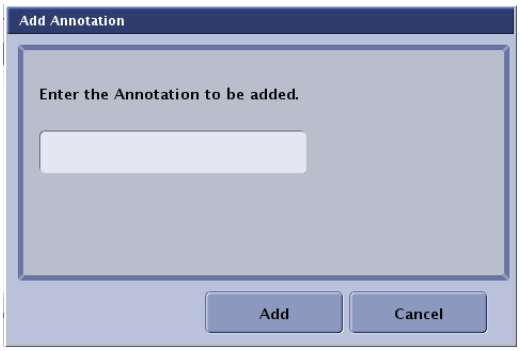
Figure 12-18 Pre-set Annotation editing



4. To change the order of the list, select the annotation.
5. Click the [▲] or [▼] buttons to move the item up or down the list.
6. Add, Edit, or Remove annotations, as described below.
7. When finished, click [SAVE] to retain your changes.
8. Click [CLOSE].

Add Pre-set Annotation

1. From the Pre-set Annotations screen, click [ADD].
2. Enter the text of the annotation.
3. Click [ADD].



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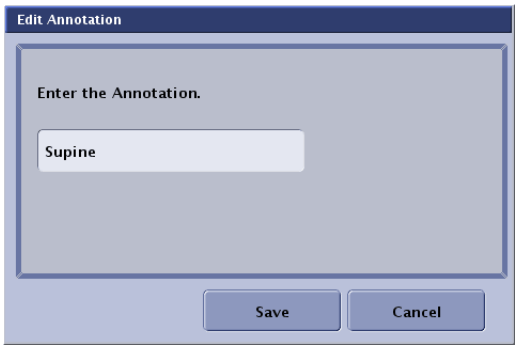
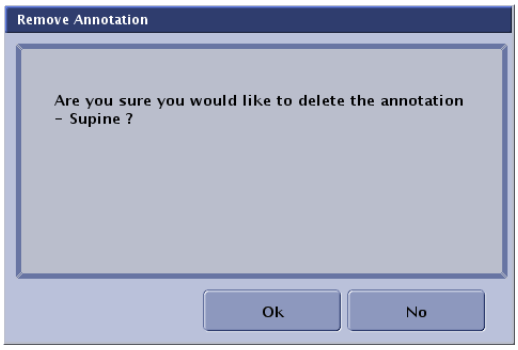
Edit Pre-set Annotation

1. From the Pre-set Annotations screen, select the annotation.
2. click [EDIT].
3. Edit the text of the annotation.
4. Click [SAVE].



Remove Pre-set Annotation

1. From the Pre-set Annotations screen, select the annotation.
2. Click [REMOVE].
   - A message appears: "Are you sure you would like to delete the annotation – (annotation name)?"
3. Click [OK].



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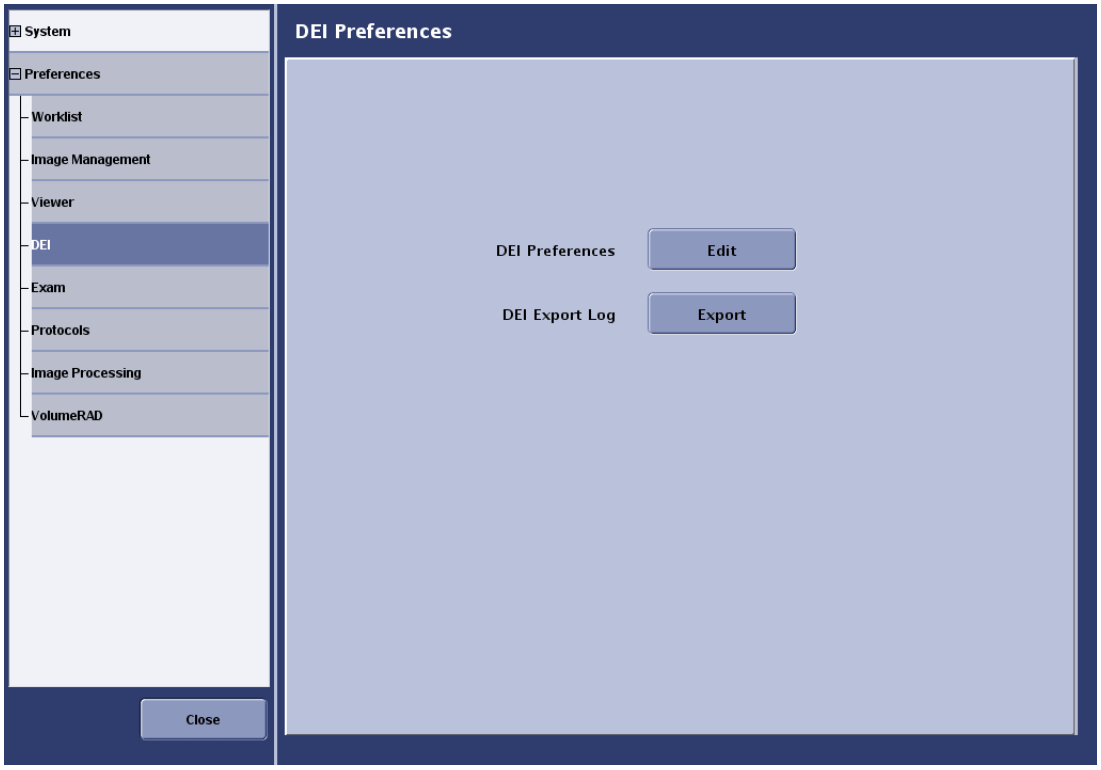
DEI (Detector Exposure Indicator)

Figure 12-19 Preferences - DEI screen



The Detector Exposure Index screen allows you to control if or how the DEI is displayed on the Image Viewer screen and to change the lower and upper limits for anatomical views.

These settings determine how DEI is displayed for all images.

Follow this process to change the DEI settings.

1. From the Worklist screen, press [UTILITIES].
2. Select **Preferences > DEI**.
3. Press DEI Preferences [EDIT].
   - The Detector Exposure Index screen (Figure 12-20) appears.
4. Continue with *Change the DEI Display* (p. 12-30) or *Change the Lower and Upper Limits* (p. 12-31).

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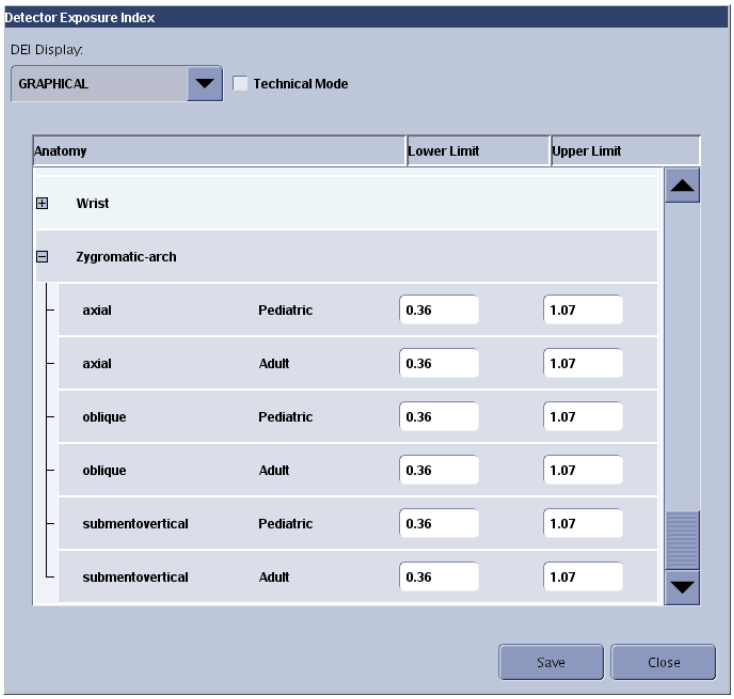
Figure 12-20 Detector Exposure Index screen



Change the DEI Display

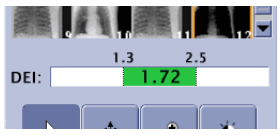
1. On the Detector Exposure Index screen, click the DEI Display drop-down list to open it.
2. Select the display option.
   - Available options are:
     - No Display

In this example, there is no DEI information displayed on the Image Viewer screen.

     - Numerical

In this example, only numerical DEI information displayed on the Image Viewer screen.

     - Graphical



In this example, DEI information is displayed is both numerically and graphically on the Image Viewer screen. This is the recommended display option.

3. Press [SAVE] to apply the change and close the screen.
   - [CLOSE] closes the screen without saving the changes.

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Change the Lower and Upper Limits

1. On the Detector Exposure Indicator screen, click an anatomical category to expand it.
   - Click the category again to close it.
2. Change the lower and upper limits in the text boxes as appropriate for the view.
3. Repeat steps 1 and 2 for all applicable anatomical categories.
4. Click [SAVE] when finished to apply the changes and close the screen.
   - [CLOSE] closes the screen without saving the changes.

Enable or Disable Technical Mode

Technical Mode is a special setting that configures the system for image quality testing and detector calibration. When Technical Mode is enabled, DEI is calculated using the central area of the image (512 pixels x 512 pixels) regardless of the imaged anatomy.

IMPORTANT!: Do not acquire exam images when Technical Mode is enabled. The use of Technical Mode is reserved for image testing and calibration purposes only.

The checkbox (Figure 12-21) indicates if Technical Mode is enabled. Check or uncheck the box as appropriate and press [SAVE] to apply the change and close the screen.

Figure 12-21 Technical Mode checkbox

Export the DEI Log

The DEI Log is used by GE Service personnel to track the doses to the detector over time. Continued low or high DEI values may indicate that the system needs calibration or that protocols and looks should be edited to accommodate your facility's needs.

Follow this process to export the DEI Log.

1. Insert a blank CD-R or CD-RW disc.
2. From the Worklist screen, press [UTILITIES].
3. Select **Preferences > DEI**.
4. Press the DEI Export Log [EXPORT] button.
5. Remove the disc when export is complete.

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Exam

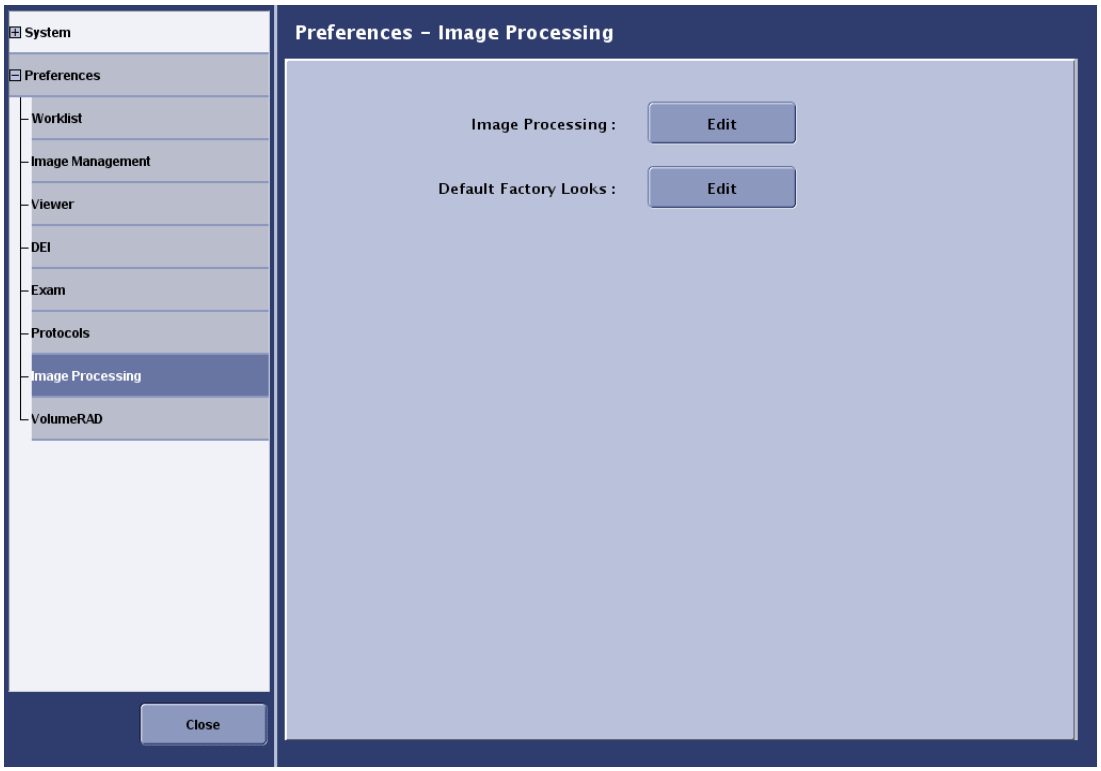
The Exam preferences configure settings for Auto Positioning. Refer to *Chapter 13: Advanced Applications and Options-Auto Positioning Preferences* (p. 13-34) for more information.

Image Processing

The Image Processing preferences allow you to change which look is the default for the anatomical view. Image Processing Preferences also allow you to view the settings of default factory looks or to create up to five (5) custom looks.

NOTE: Custom looks and the default looks mapping can be backed up by having GE Service personnel perform a system backup. It is recommended that a system backup be performed after any change to the default looks mapping or when custom looks are built. Ask your GE Service personnel to perform the system backup at their next visit. GE Service personnel can restore the settings from the backup, if necessary.

Figure 12-22 Preferences – Image Processing



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Change Default Factory Looks for Exams

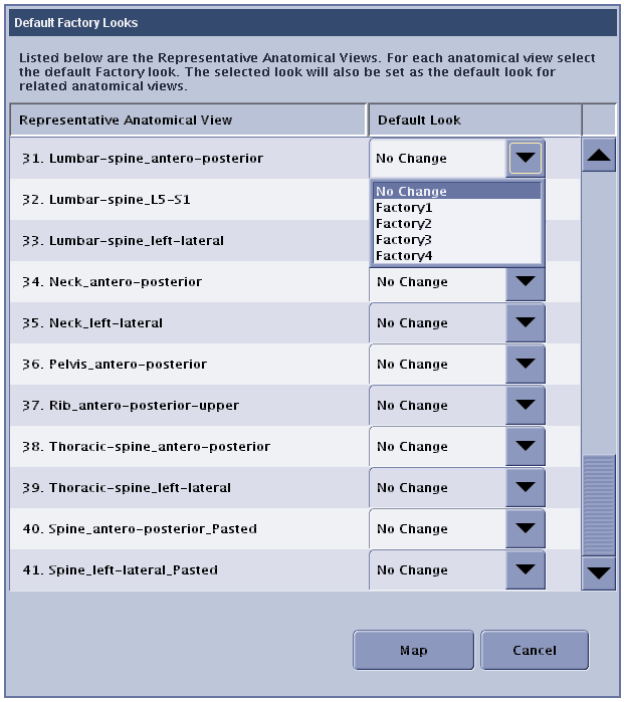
The Default Factory Looks screen (Figure 12-23) allows you to change the default processing setting for all 41 representative anatomical views, and then map this change to related anatomical views. Note that this may over-ride existing default settings.

At the initial applications setup, the radiologist chooses the default look for each anatomical view. Application specialists assign the looks to the system.

Follow this process to change the default factory looks.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Processing**.
3. Click Default Factory Looks [EDIT].
4. Use the drop-down lists to change the default for the desired anatomical views.
5. When finished, click [MAP] to save the changes.
   - A message appears: "Default look settings for selected Representative Anatomical Views will be mapped to related anatomical views."
6. Click [CONFIRM] to apply the looks settings. [CONFIRM] will close the message and return you to the Image Processing screen.
   - [CANCEL] closes the message and returns you to the Default Factory Looks screen.

Figure 12-23 Default Factory Looks



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Build Custom Looks

Looks are the way an image is processed to be viewed by a radiologist for interpretation.

Looks are pre-defined combinations of brightness, contrast, edge enhancement, and tissue equalization (TE). Refer to *Tissue Equalization Overview* (p. 12-38) for more information.

Factory Look descriptions:

- Factory Look 1 – similar to analog film, low edge, no TE
- Factory Look 2 – low CR look, low edge, moderate tissue contrast
- Factory Look 3 – moderate CR look, low edge, TE
- Factory Look 4 – highly digital look, high edge, high TE

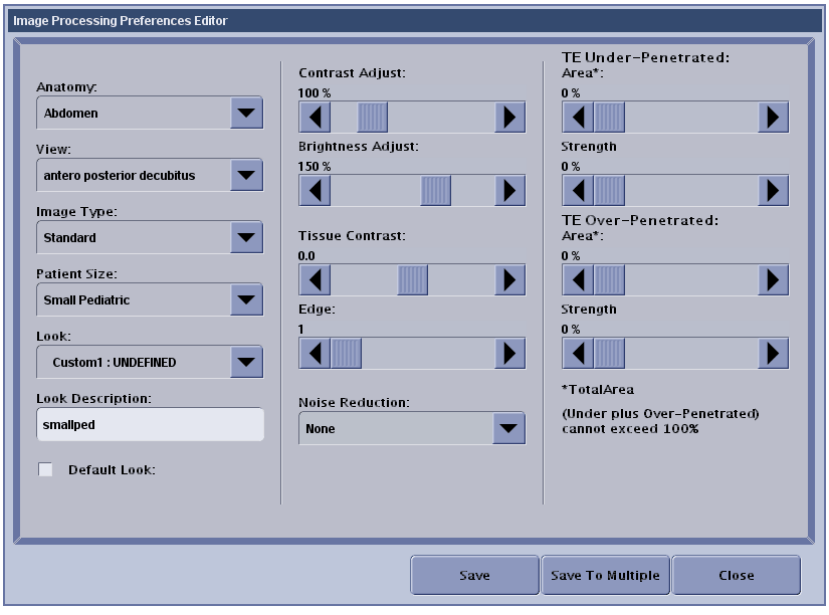
These factory looks apply to all exams.

Follow this process to create an new custom look.

Recommendation: When building a custom look, start with the factory look that is closest to the desired result. Write down the values and apply them to a new custom process. Then change the applicable variables.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Processing.**
3. Click Image Processing [EDIT].
   - The Image Processing Preference Editor (Figure 12-24) appears.

Figure 12-24 Image Processing Preference Editor



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4. Select the **Anatomy** (for example: Chest, Abdomen, Lumbar Spine, etc.).
5. Select the **View** (for example: antero-posterior or lateral).
6. Select the **Image Type**. Available options are: Standard, Soft-Tissue, and Bone (some systems may only have Standard image type available).
7. Select the **Patient Size.** Available options are: Small Adult, Medium Adult, Large Adult, Small Pediatric, Medium Pediatric, or Large Pediatric.
8. Select the **Look**. Choose the first "Undefined" Custom look.

NOTE: If Factory Look is selected, parameters are read-only. Only Custom processing looks can be changed.

9. Enter new name in **Look Description** to rename the look.
   - The system will not accept a new look if the name remains "Undefined."
10. Check the **Make Default** box to set this look at the default for the selected Anatomy.
11. Adjust parameters as described in Table 12-10. Parameters may be adjusted in any order.

Table 12-10 Image Processing parameters

Parameter	Definition
Contrast Adjust	Adjusts image contrast. Also known as window width. • Move the slider right for more contrast (towards pure black and white). • Move the slider left for less contrast (towards uniform gray). Range: 25% – 400% with increment of 1%
Brightness Adjust	Adjusts image brightness from 25% -210%. Also known as window level. • Move the slider right for a lighter image. • Move the slider left for a darker image. **NOTE:** Brightness Adjust and Contrast Adjust should not be used for per-image tuning/correction of brightness and contrast. They are used to modify the default look of images from a particular exam. For example, if images from a particular type of exam are appearing consistently lighter than they should be, the Brightness Adjust slider can be moved left to adjust. However, for small alterations of brightness on a particular image, use the Brightness and Contrast controls on the Image Viewer screen.

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Parameter	Definition
Tissue Contrast	Controls the general contrast between the thick and thin anatomy. • Move the slider right to decrease bone/soft-tissue contrast. • Move the slider left to increase bone/soft-tissue contrast. Range: –0.15 to 0.15 with 0.01 increments. **NOTE:** Unlike Tissue Equalization, which controls contrast within under-penetrated (thick) or over-penetrated (thin) areas, Tissue Contrast controls the general contrast between the thick and thin anatomy. For example, Tissue Contrast can be used in combination with Tissue Equalization to define a Chest PA look that is equalized in the lung fields, but with light spine/ribs.
Edge	The amount of detail visible in bone structures. Increased edge equals increased detail. • Move the slider right to make images sharper. • Move the slider left to make images smoother. Range: 1 to 10 (discrete setting) with increments of 1.
Noise Reduction	Suppresses the mottle noise in denser areas of the anatomy while preserving detail in the rest of the image. Available options are: • None – no noise reduction • Low • Medium • High – maximum noise reduction **NOTE:** The noise reduction feature suppresses the mottle noise in denser areas of the anatomy while preserving detail in the rest of the image. The algorithm takes into account tissue penetration and dose reaching the detector. For example, if two Chest PA images were acquired on the same patient, one with much higher dose than the other, noise reduction may only affect the lower dose (higher noise) image. In general, the lowest Noise Reduction setting that produces the desired image quality should be selected.

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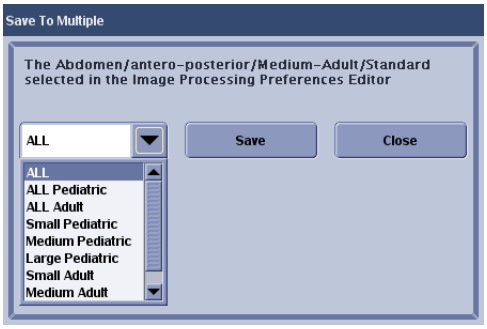
Parameter	Definition
TE Settings	See Tissue Equalization section for range and effect of TE sliders. Refer to *Tissue Equalization Overview* (p. 12-38) for more information. **NOTE:** The combined total of the TE Under-penetrated and TE Over-penetrated areas cannot exceed 100%. The slider will automatically stop and a message appears: "The Total Area cannot exceed 100%. Reduce the (Under- or Over-) Penetrated area to proceed."

12. When finished adjusting parameters, click [SAVE] or [SAVE TO MULTIPLE].
    - [SAVE] applies the parameters to the currently selected patient size.
      - A message appears: "Save changes?"
      - Click [YES].
    - [SAVE TO MULTIPLE] applies the parameters to multiple patient sizes within the selected anatomy.
      - The Save to Multiple screen appears.
      - Select the **Patient Size** to save the new look to.
      - Click [SAVE].



13. Click [CLOSE] on the Image Processing Preference Editor.

Change Image Processing from the Viewer

Changing the image processing from the Image Viewer screen allows the user to preview the effect of different looks (factory or custom) before applying the look to the image.

The Image Processing settings may be accessed from the Image Viewer screen or the Utilities screen.

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From the Image Viewer screen:

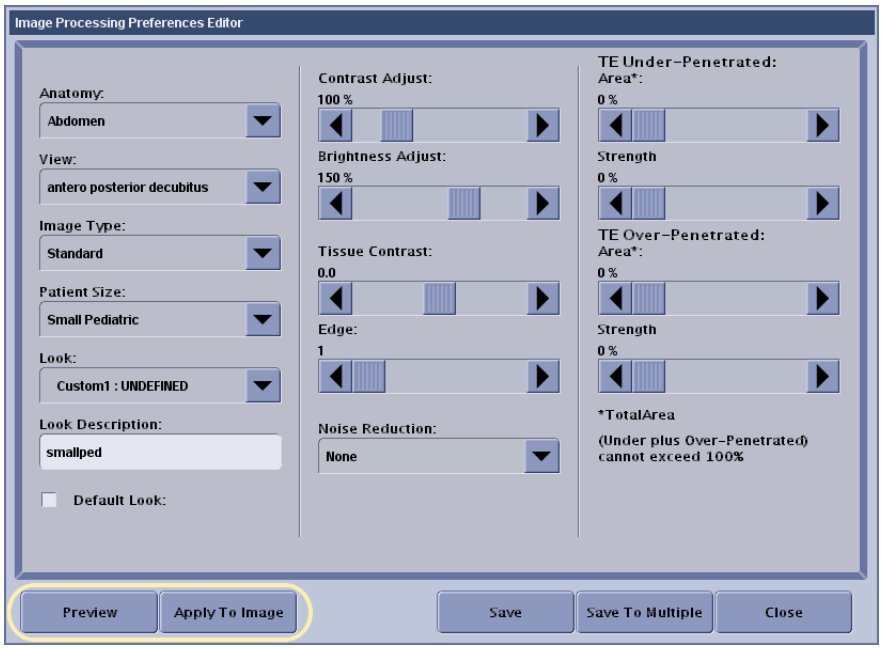
- Select the **Image Tools palette – Image Processing** tab.
- Click [EDIT PROC].

Follow the steps listed above to make the processing changes.

When opened from the Image Viewer screen the, Image Processing Preference Editor screen also has a [PREVIEW] and [APPLY TO IMAGE] button.

- [PREVIEW] applies the settings to the currently selected image in the Image Viewer screen so that you can see the effect before saving the changes.
- [APPLY TO IMAGE] creates a new instance of the image processed with the selected look.

Figure 12-25 Image processing preferences editor screen opened from the Viewer



Tissue Equalization Overview

Tissue Equalization (TE) is an advanced image-processing algorithm that improves contrast and visibility in over-penetrated and under-penetrated regions of an image without compromising the contrast in other regions of interest. In combination with the wide dynamic range of the digital detector, TE allows display of more information collected in a single shot, reducing re-takes and increasing throughput.

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TE Usage

Over-penetrated Regions

An over-penetrated region in an image results from x-rays passing through a relatively less dense region of the anatomy such as soft tissue (skin edge).

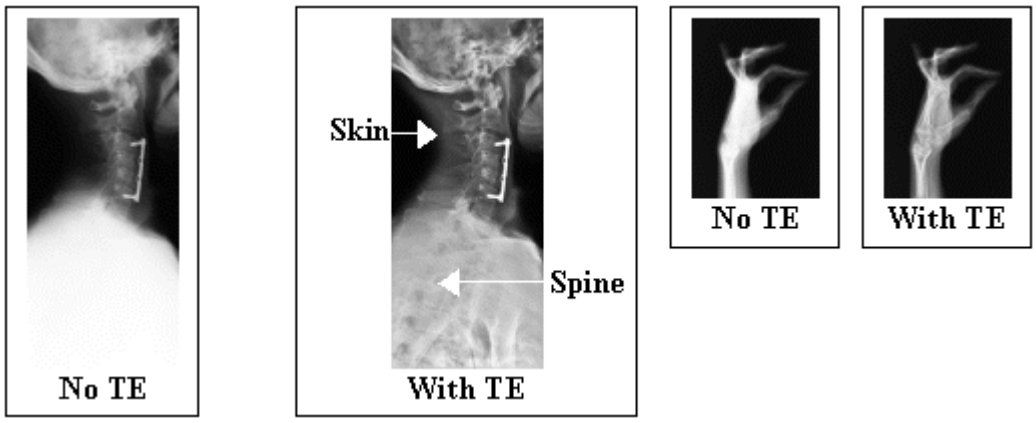
Over-penetrated regions of an image appear darker with reduced contrast. Using TE, the contrast in such regions can be enhanced to improve visualization of soft-tissue. TE can also be used to enhance vessel contrast in lungs. In Figure 12-26, the skin edge around the neck is more clearly defined with TE.

Under-penetrated Regions

An under-penetrated region in an image results from insufficient x-rays passing through relatively dense anatomical regions. For example, anatomy containing dense tissue (abdomen) and bone (ankles/wrists/shoulders) result in under-penetrated images.

Under-penetrated regions of an image such as the cervical and thoracic spine appear white- white spine obscured by the overlaying anatomy like the white shoulders. Using TE, the overlaying anatomy can be made grayer making the underlying spine more visible (Figure 12-26). A hand image can similarly be displayed with improved bone contrast. This makes TE an invaluable tool in visualizing the entire bone field.

Figure 12-26 Comparison with and without Tissue Equalization



TE Parameters

TE uses the information in the image to improve visualization. Two user-defined parameters; AREA and STRENGTH; control the extent and amount of TE that is applied to the image. There is an AREA and STRENGTH parameter for over-penetrated regions and an AREA and STRENGTH parameter for under-penetrated regions.

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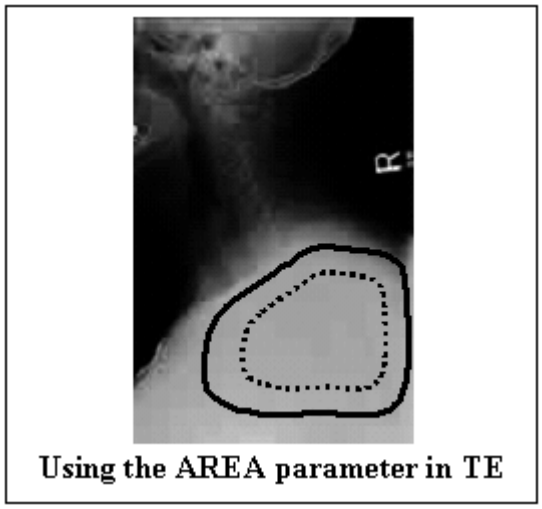
Area

The AREA parameter defines the extent of application of the TE algorithm to the image. Increasing AREA increases the number of image pixels to which TE is applied. For example, in Figure 12-27, setting the AREA to 30% for under-penetrated region uses the pixels within the dotted ROI. Increasing AREA to 60% increases the number of pixels where TE is applied, as indicated by the solid ROI.

Figure 12-27 Using the AREA parameter in TE



The combined AREA parameters for the over and under-penetrated regions cannot be greater than 100%. For example if the AREA parameter for over-penetrated regions is set to 40%, the AREA parameter for under-penetrated regions cannot be greater than 60% (100-40).

Strength

The STRENGTH parameter affects the grayness of a region when TE is applied to it. For example, increasing STRENGTH for under-penetrated regions such as shoulders makes a white region grayer. Increasing STRENGTH for over-penetrated regions such as lungs makes a black region grayer. In both cases, increasing STRENGTH generally makes the region grayer.

The effect of varying AREA and STRENGTH in TE is demonstrated in Figure 12-28 for under-penetrated regions. Increasing STRENGTH while keeping the AREA constant makes the pixel grayer in the shoulder region. Increasing AREA extends the region that becomes gray.

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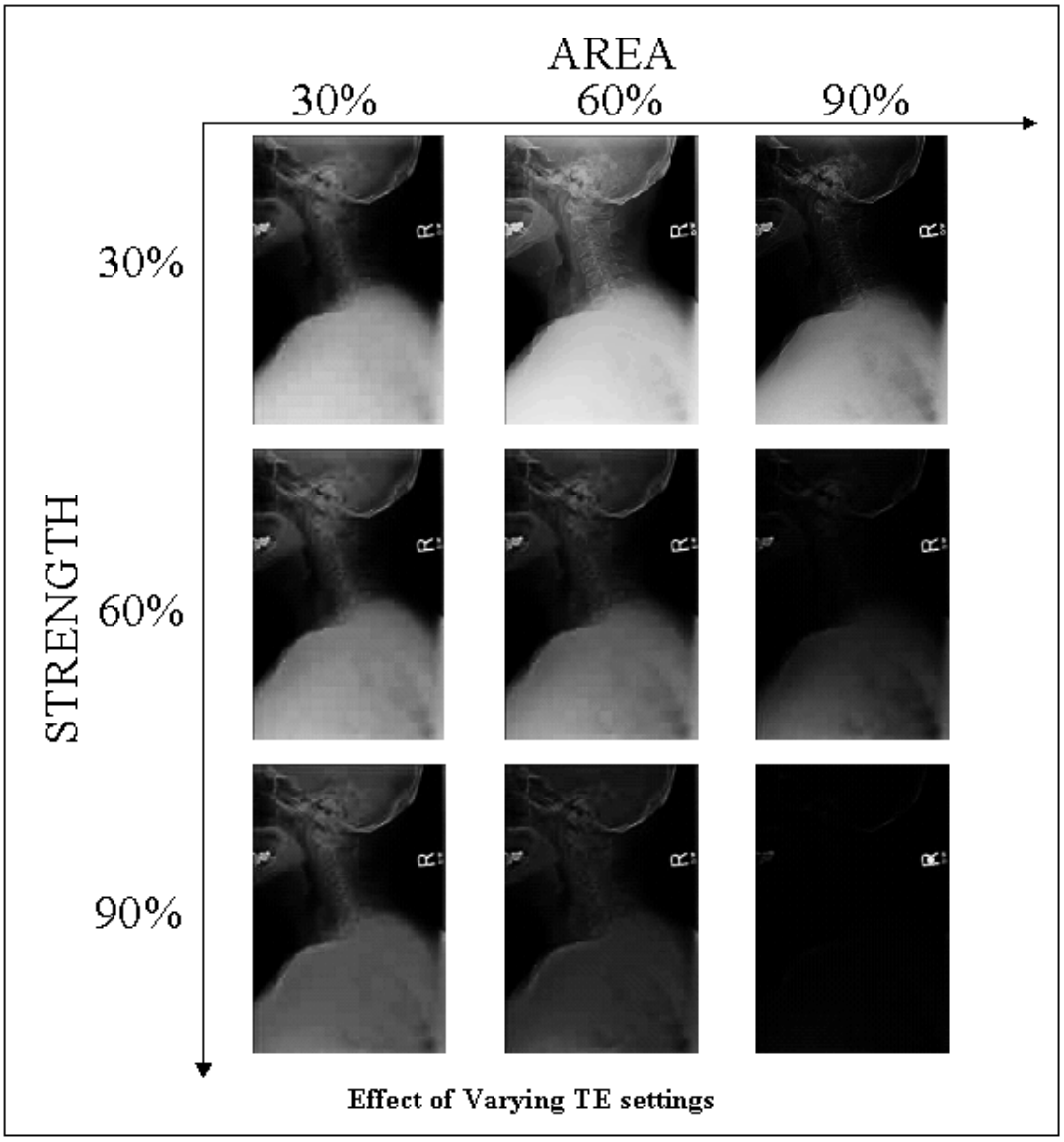
Figure 12-28 Varied TE settings



NOTE: Unlike Tissue Equalization, which controls contrast within under-penetrated (thick) or over-penetrated (thin) areas, Tissue Contrast controls the general contrast between the thick and thin anatomy. For example, Tissue Contrast can be used in combination with Tissue Equalization to define a Chest PA look that is equalized in the lung fields, but with light spine/ribs.

NOTE: The described visual effects of changing TE parameters assumes that the brightness/contrast settings are such that the display window center (WC) and window width (WW) is the same. The user may need to re-adjust the WW and WC after TE adjustment to see the TE effect shown in Figure 12-28.

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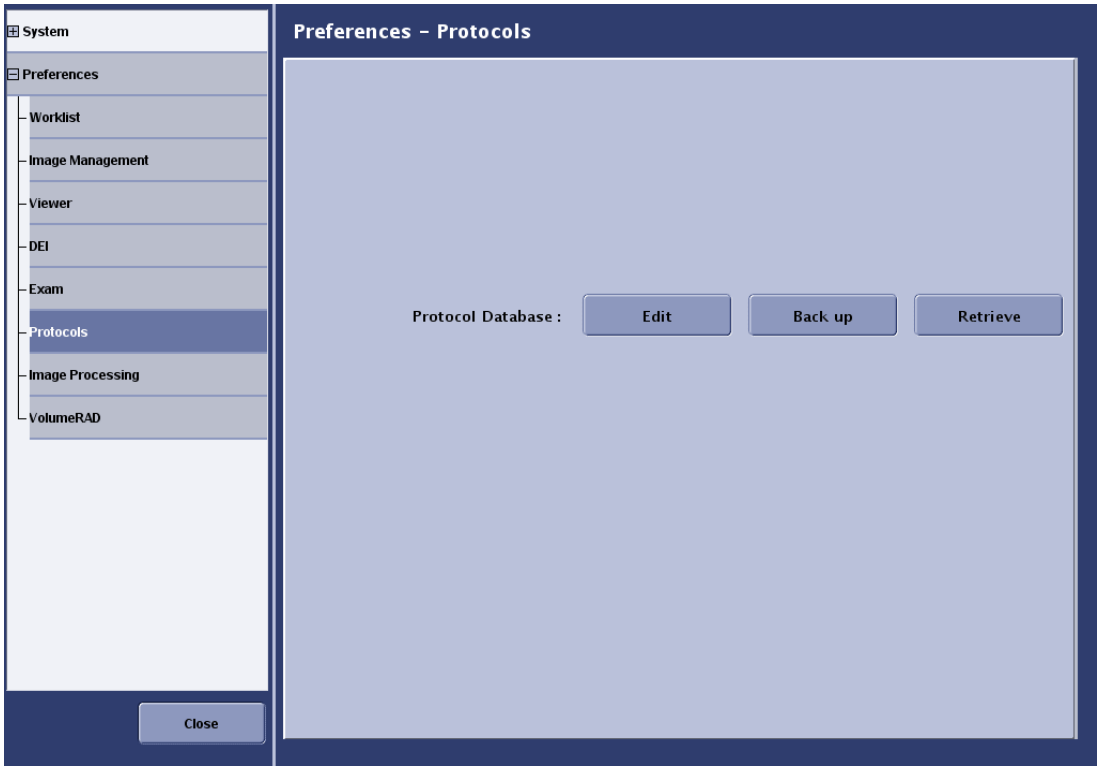
Protocols

Protocols preferences allow you to create backup copies of the protocol database, retrieve saved backups, and create new protocols.

Figure 12-29 Preferences - Protocols screen



Backup Protocol Database to CD

The Backup function allows you to save the entire protocols database (parameters) to a CD. This is important when editing protocols; backup ensures that the current database stays intact. Backup is also important in case of system failure and all protocol information is lost. If necessary, the old database can be retrieved and used.

Follow this process to back up the database to a CD.

NOTE: Always use a new, blank CD-R or CD-RW for each back up.

1. From the Worklist screen, click [UTILITIES].
   - The Utilities screen appears.
2. Select **Preferences > Protocols.**
3. Insert a blank CD into the CD tray.

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4. Click [BACK UP].
   - A message appears: “Press OK to continue with Protocol Database back up.”
5. Click [OK].
   - A message appears: “Protocol Database back up in progress. Please Wait. This might take 2-3 minutes.“
     - [CANCEL] stops the database backup.
   - When backup is complete, a message appears: “The Protocol Database back up operation is successful.“
6. Click [OK] to dismiss the message.
7. Remove the CD from the CD tray.
8. Label the CD and store it in a safe place.

Retrieve Protocol Database from CD

The Retrieve function allows you to re-cover a protocol database that was saved to a CD.

NOTE: When retrieving, the procedures saved on the CD will overwrite all of the procedures on the system.

Follow this process to retrieve a protocol database from CD.

1. From the Worklist screen, click [UTILITIES].
   - The Utilities screen appears.
2. Select **Preferences > Protocols**.
3. Insert the CD with the saved protocols database into the CD tray.
4. Close the CD tray.
5. Click [RETRIEVE].
   - A message appears: “Press OK to continue with Protocol Database retrieve.”
6. Click [OK].
   - The saved protocol database is loaded onto the system.
7. Remove the CD from the CD tray. Store the CD in a safe place.

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Edit Protocol Database

The Protocol Editor allows you to create custom acquisition protocols. It allows the creation of anatomical categories, exam sets, and individual views for exams.

It allows the edit and removal of categories, exams, and views.

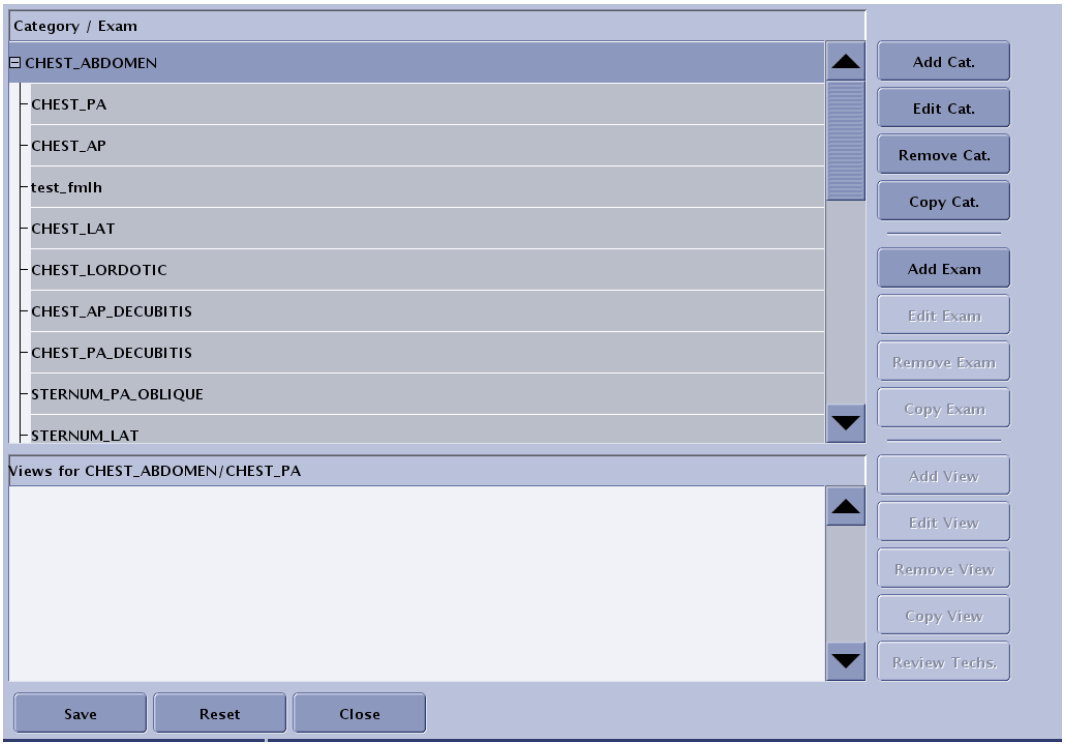
NOTE: Names of categories, exams, and views cannot contain spaces. Use underscores (_) to separate words (for example, "Neck_AP").

NOTE: It is recommended that you back up the database to CD before and after custom changes are made. Database backup is done by clicking the [BACKUP] button on the Preferences - Protocols screen. Refer to *Backup Protocol Database to CD* (p. 12-42) for more information.

Follow this process to access the Protocol Database Editor.

1. From the Worklist, select [UTILITIES].
2. Select **Preferences > Protocols**.
3. Click [EDIT].
   - The Exam Menu appears.
4. Continue with *Add or Edit Category* (p. 12-45), *Add or Edit Exam* (p. 12-46), or *Add or Edit View* (p. 12-47).

Figure 12-30 Exam Menu



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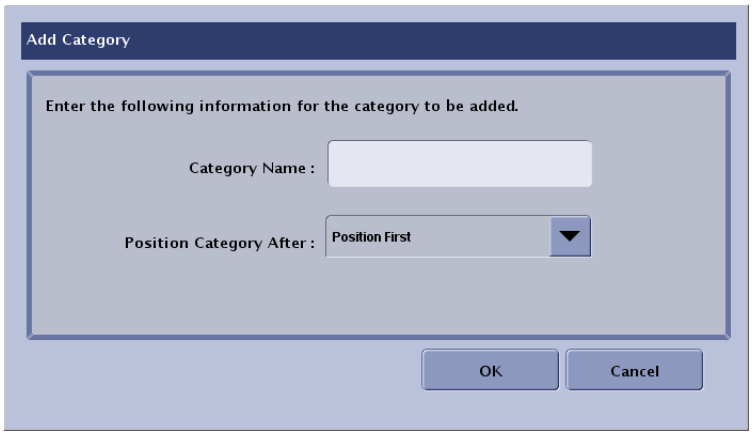
Add or Edit Category

NOTE: The screens and process to edit a category are the same as for adding a category.

From the Exam Menu:

1. Click [ADD CAT] or [EDIT CAT].
   - If editing a category, select the category first, then click [EDIT CAT].
   - The Add Category (or Edit Category) screen appears.



2. Type a **Category Name**. (Use underscores instead of spaces.)
3. From the **Position Category After** drop-down list, select the placement of the new category on the category list.
4. Click [OK].
5. Continue with *Add or Edit Exam* (p. 12-46).

NOTE: Exams and views must be added or copied into the new category in order for it to be fully functional.

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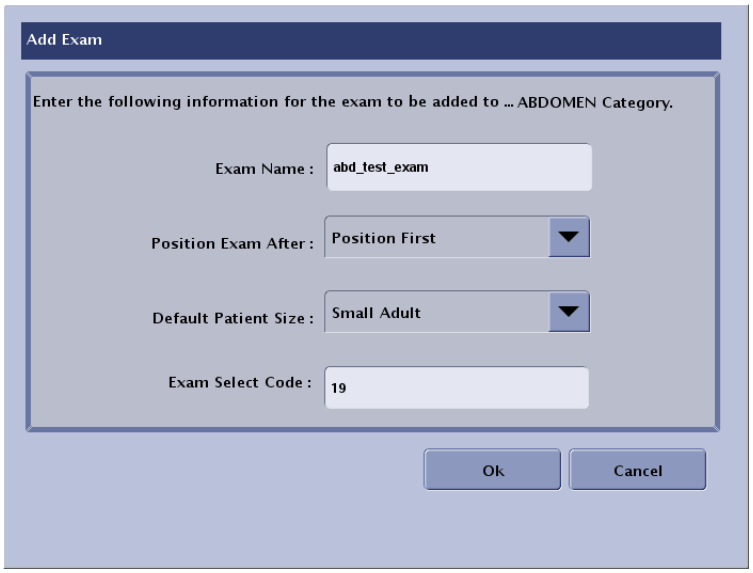
Add or Edit Exam

NOTE: The screens and process to edit an exam are the same as for adding a exam.

From the Exam Menu:

1. Select the category for the new exam.
2. Click [ADD EXAM] or [EDIT EXAM].
   - The Add Exam (or Edit Exam) screen appears.



3. Type an **Exam Name**. (Use underscores instead of spaces.)
4. From the **Position Exam After** drop-down list, select the position of the exam within the category.
5. Select the **Default Patient Size** for the exam.

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6. Enter the **Exam Select Code**, if Automatic Protocol Recognition (APR) is enabled on your system. Refer to *Chapter 6: Image Acquisition-Automatic Protocol Recognition (APR)* (p. 6-14) for more information about APR.
   a) Obtain list of local HIS/RIS procedure entry codes.
   b) Login as a super-user with access to edit preferences.
   c) Go to **Preferences > Protocols**, [EDIT EXAM].
   d) Add codes for corresponding exams into the **Exam Select Code** field.

NOTE: The following characters are not allowed in the Exam Select Code field:

NOTE: Be sure that all other information on the screen, especially the default patient size is correct.

NOTE: If your facility is using or building procedures specifically for LEFT and RIGHT sides, make sure that the correct code for the side is added.

   e) When finished entering codes, back up the protocol database.
      – Procedure codes will be backed up when the Protocol Database is backed up. Refer to *Chapter 12: Set Preferences-Backup Protocol Database to CD* (p. 12-42) for more information.
   f) For new exams, add the procedure entry code at time of creation.

7. Click [OK].
8. Continue with *Add or Edit View* (p. 12-47).

NOTE: Exams must be populated with new or copied views after creation in order to be fully functional

Add or Edit View

NOTE: The screens and process to edit a view are the same as for adding a view.

NOTE: This process has multiple screens.

From the Exam Menu:

1. Expand the **Category**.
2. Select the Exam to add or copy the new view to.

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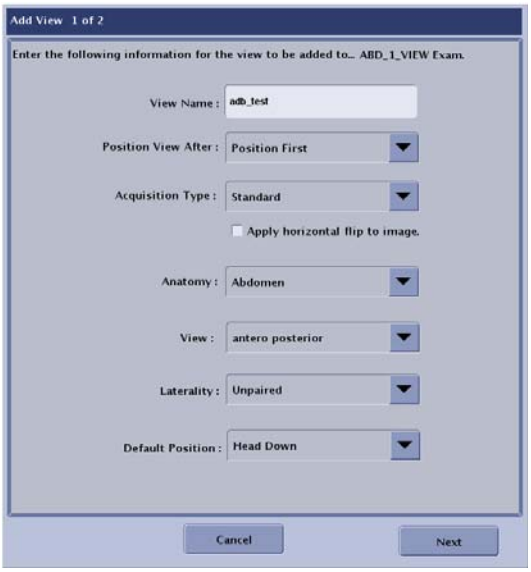
3. Click [ADD VIEW] or [EDIT VIEW].
   - The Add View (or Edit View) screen (1 of 2) appears..



4. Type a **View Name**. Do not use spaces. Use underscores (_) to separate words.
5. From the **Position View After** drop-down list, select the placement of the view within the exam.
6. Select the **Acquisition Type**:
   - Available options are:
     - Standard
     - Dual Energy
     - Pasting (if enabled)
7. Check if **horizontal flip** is to be applied when displaying the image.
8. Select the **Anatomy**.

NOTE: The selected anatomy will determine the image processing for the view. Be sure to select the appropriate anatomy for the body part imaged.

NOTE: The anatomy of "Spine" should only be used for creating Image Pasting exams. Normal spine exams (not Image Pasting) should use "Cervical Spine," "Thoracic Spine," or "Lumbar Spine" as appropriate. Refer to *Chapter 13: Advanced Applications and Options-Image Pasting* (p. 13-7) for more information about Image Pasting.

9. Select the most appropriate **View** (AP, Lat, etc.).
   - The selected anatomy determines which views are available.

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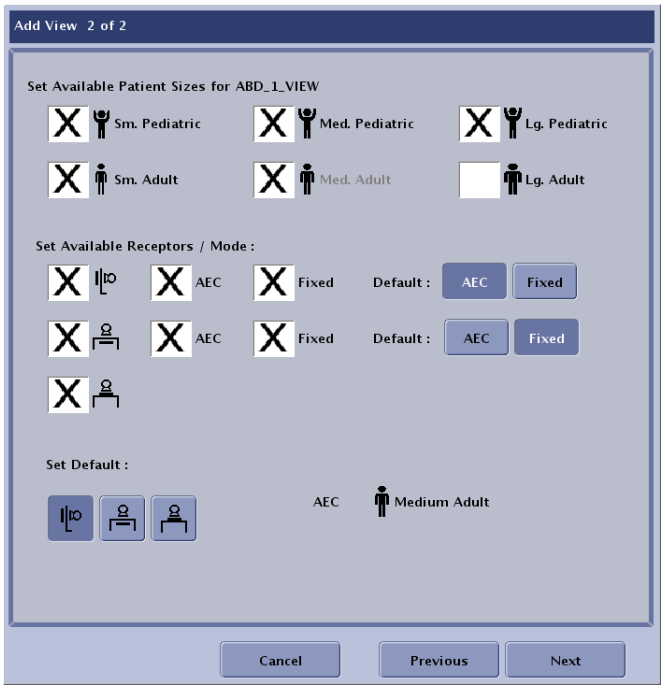
10. Select the **Laterality**:
    - The selected anatomy determines which laterality options are available.
      - If the anatomy is unpaired, then Unpaired is the only available selection.
      - If the anatomy is paired, the available sections are: Both, Left, and Right.
      - Paired anatomy enables the Patient Side control on the Image Acquisition screen. Refer to *Chapter 6: Image Acquisition* for more information.
11. Select the **Default Position**:
    - The selected anatomy determines which positions are available. In general:
12. If the anatomy is unpaired, the selections are Head Down or Head Up
13. If the anatomy is paired, the selections are Digits to Back, Digits to Feet, Digits to Front, Digits to Head.
14. Click [NEXT].
    - The Add View (or Edit View) screen (2 of 2) appears.

Figure 12-31 Add (or Edit) View (2 of 2).



15. Select all **Patient Sizes** you want available for the view. The default size will automatically be selected.
16. Select **Receptors and Modes** for each selected receptor.

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17. Select the **Default Mode** (AEC or Fixed) for each receptor.
    - Default Mode selection is not available for all views.
18. Select the **Default Receptor**.
19. Click [NEXT].
    - The Review screen appears.

ABDOMEN / ABD_1_VIEW /
adb_test
Standard Acquisition
kV
mA
mAs (Fixed only)
msec (b = back-up time)
Speed
SID
Ion Chamber (AEC Only)
Focal Spot
Cu Filter
Grid
Small Adult AEC 40 10 N/A 25.0 400 100 LCR Small no in
* Med Adult AEC 40 10 N/A 25.0 400 100 LCR Small no in
Small Ped AEC 40 10 N/A 25.0 400 100 LCR Small no in
Med Ped AEC 40 10 N/A 25.0 400 100 LCR Small no in
Large Ped AEC 40 10 N/A 25.0 400 100 LCR Small no in
Small Adult FIXED 40 10 0.25 25.0 400 100 N/A Small no in
Med Adult FIXED 40 10 0.25 25.0 400 100 N/A Small no in
Small Ped FIXED 40 10 0.25 25.0 400 100 N/A Small no in
Med Ped FIXED 40 10 0.25 25.0 400 100 N/A Small no in
Large Ped FIXED 40 10 0.25 25.0 400 100 N/A Small no in
Exam Menu
Edit Technique

- The default patient size is shown with an asterisk (*) to the left of the size indicator.
- The ion chambers, if applicable, are labeled L (left), R (right), and C (center). Refer to *Chapter 4: Automatic Exposure Control (AEC)-Applications* (p. 4-5) for a graphic that shows the ion chambers.

20. Select the patient size to edit.
21. Click [EDIT TECHNIQUE].
    - The Edit Techniques screen appears

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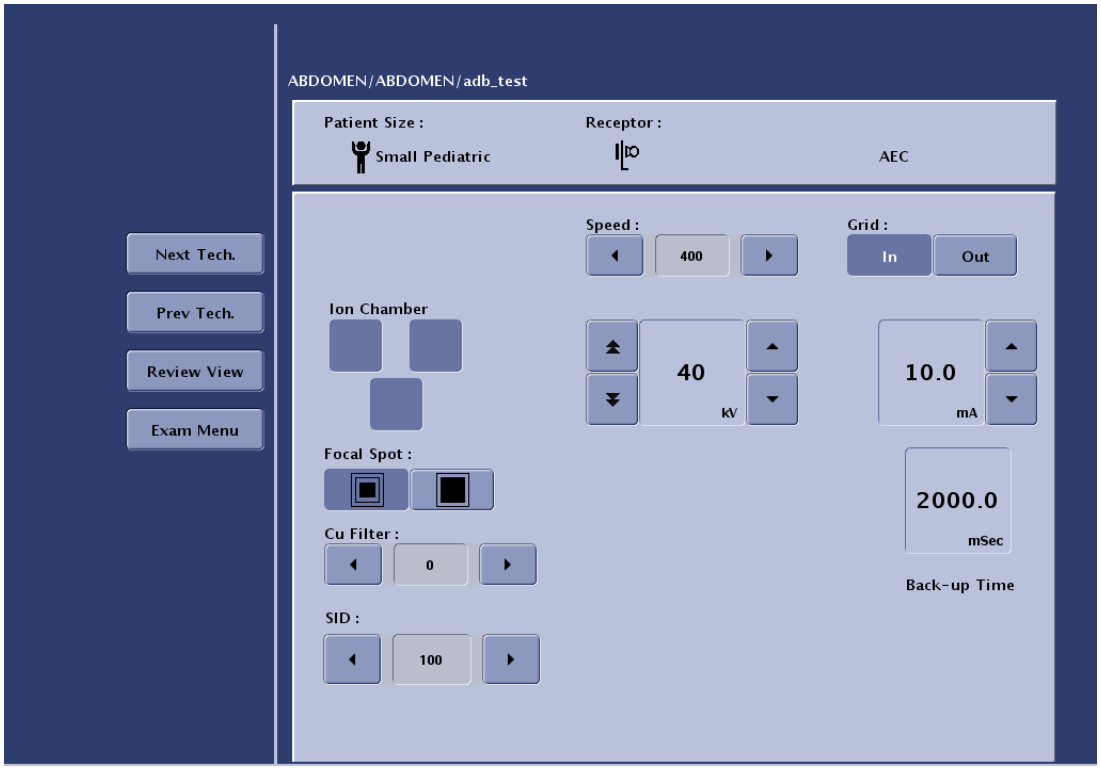
Figure 12-32 Edit Technique screen.



22. Change the technique parameters as appropriate.

CAUTION: **If no technical factors are present in the system, the default settings are:**

- **kV = 40**
- **mA = 25**
- **mAs = .25**
- **SID = 100cm**
- **Grid = In**

No exposures should be made until the user selects values appropriate for the patient size.

23. Upon completion for each view, click [NEXT TECH] to adjust techniques for the next configured patient size.

24. When finished, click [EXAM MENU].

    - The Exam Menu appears.

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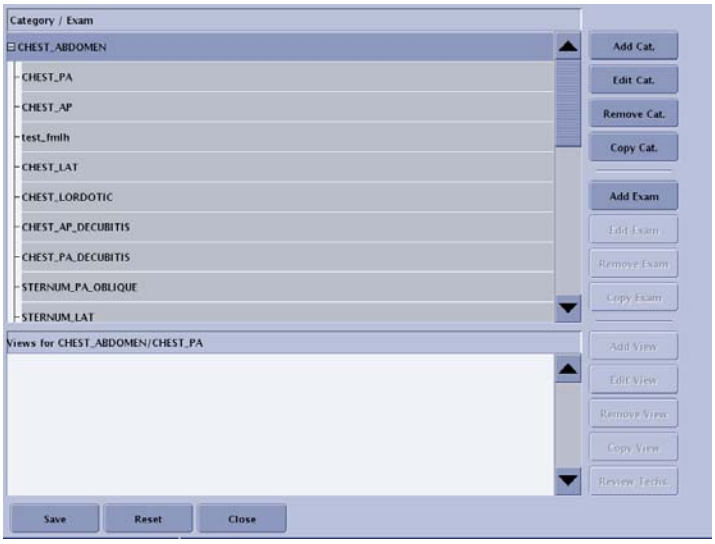
25. Click [SAVE].
    - A message appears: “Changes to the Protocol Database will be saved.”
    - [RESET] clears all changes to the database since the last time it was saved.
26. Click [OK].
    - The Preferences – Protocols screen appears.
27. Click [CLOSE].
    - A message appears: “Changes have been made to the Protocol Database. Would you like to save these changes?”
28. Click [YES].
    - The Exam Menu screen closes and returns you to the Preferences - Protocols screen.

Protocol Editor Copy Functions

Follow this process to access the Protocol Database Editor.

1. From the Worklist, select [UTILITIES].
2. Select **Preferences > Protocols**.
3. Click [EDIT].
    - The Exam Menu appears

Figure 12-33 Exam Menu screen.



4. Click [COPY] for Category, Exam, or View.
5. Continue with *Copy Category* (p. 12-53), *Copy Exam* (p. 12-53), or *Copy View* (p. 12-54)

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Copy Category

1. Select the Category.

1. Click [COPY CAT].

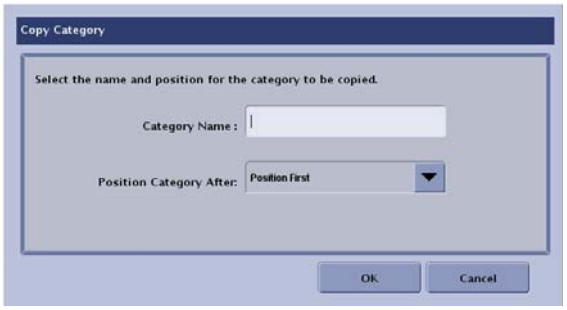
2. Enter the new name to use or retype the existing name

NOTE: If reusing the existing name, be sure to include any underscores in the title.

3. Select the position on the Category list.

4. Click [OK].

5. Continue with *Copy Exam* (p. 12-18).



Copy Exam

1. Select the Exam to copy.

2. Click [COPY EXAM].

3. Enter the new name to use or retype the existing name.

4. Enter the **Exam Select** code.

5. Select the **Category** to copy to.

6. Select the **position** on the Exam list.

7. Click [OK].

8. Continue with *Copy View* (p. 12-54).

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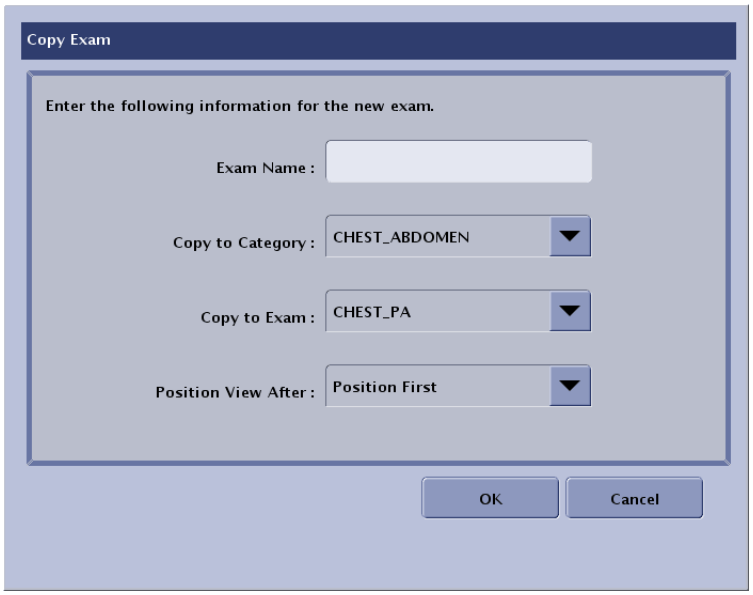
Copy View

1. Select the View to copy.
2. Click [COPY VIEW].
3. Enter the **Exam Name** to use or retype the existing name.
4. Select the **Copy to Category** from the list.
5. Select the **Copy to Exam** from the list.
6. Select the **Position View** from the list.
7. Click [OK].



VolumeRAD

The VolumeRAD preferences configure setting for VolumeRAD. Refer to *Appendix A: VolumeRAD™* for more information.

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Chapter 13
Advanced Applications and Options

Topics covered include:

- Dual Energy (p. 13-2)
  - Overview (p. 13-2)
  - Acquisition and Images (p. 13-3)
  - General Guidelines (p. 13-3)
  - Technique Settings and Image Quality for Chest Exams (p. 13-3)
    - Patient Size (p. 13-3)
    - High kVp (p. 13-4)
    - Low kVp (p. 13-4)
    - Copper Filtration (p. 13-4)
    - Grid (p. 13-4)
    - Technique Settings and Image Quality for Abdominal Exams (p. 13-5)
  - Technique Settings and Image Quality for Abdominal Exams (p. 13-5)
    - Patient Size (p. 13-5)
    - High kVp (p. 13-5)
    - Low kVp (p. 13-5)
    - Copper Filtration (p. 13-5)
  - Patient Dose (p. 13-6)
  - Dual Energy Image Processing Preferences (p. 13-6)
- Image Pasting (p. 13-7)
  - Overview (p. 13-7)
  - Image Pasting Patient Positioner (p. 13-8)
    - Lock Positioner in Place (p. 13-8)
    - Move Lateral Positioning Bars (p. 13-10)
  - Image Pasting Acquisition (p. 13-10)
  - Alternate Image Pasting Acquisition Workflows (p. 13-16)
    - Legs (p. 13-16)
  - Image Viewer (p. 13-18)
    - View Pasted Composite Image (p. 13-19)
    - Select Images (p. 13-19)
    - Re-Process Images (p. 13-20)
    - Re-paste (p. 13-20)
    - Change Looks Processing (Vertical Equalization) (p. 13-23)
    - Print Pasted Images (p. 13-24)
  - Image Pasting Preferences (p. 13-25)
    - Configure Default Print/Auto Print Settings (p. 13-25)
    - Add or Edit Image Pasting Protocols (p. 13-26)
    - Edit Image Processing (p. 13-27)

(continued on the next page)

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(continued from the previous page)

- Auto Positioning (p. 13-28)
  - Overview (p. 13-28)
    - OTS (p. 13-28)
    - RCIM (p. 13-29)
    - Pre-defined Positions (p. 13-29)
  - Initiate Auto Positioning (p. 13-30)
    - Auto Positioning from Worklist Screen (p. 13-30)
    - Auto Positioning from Image Acquisition Screen (p. 13-31)
    - Auto Positioning from Wall Stand Hand Control (p. 13-33)
  - Auto Positioning Preferences (p. 13-34)
    - Select Default Auto Positioning for Receptors (p. 13-34)
- Orthopedic Magnification (p. 13-36)
  - Overview (p. 13-36)
  - Print Images (p. 13-36)
    - Print Single Image (p. 13-36)
    - Print Multiple Images (p. 13-37)
  - Orthopedic Magnification Preferences (p. 13-38)
    - Configure Default Print Settings and Auto Print (p. 13-38)

Dual Energy

Overview

Dual Energy (DE) imaging is an imaging technique in which a low-kVp image and a high-kVp image are acquired in rapid succession. The acquired images are processed to create a soft-tissue image and a bone image, which are provided in addition to the standard (high-kVp for chest DE and low-kVp for abdomen) image.

NOTE: Dual Energy is only possible with full digital exams, that is, only the wall stand and table receptors. Dual Energy cannot be performed on a cassette exam.

Dual Energy acquisitions are currently enabled only for Chest and Abdomen AP and PA anatomical views. Dual Energy has significant potential for improving the conspicuity of chest pathology by removing the bone structures and for improving specificity by providing calcification information in the bone image.

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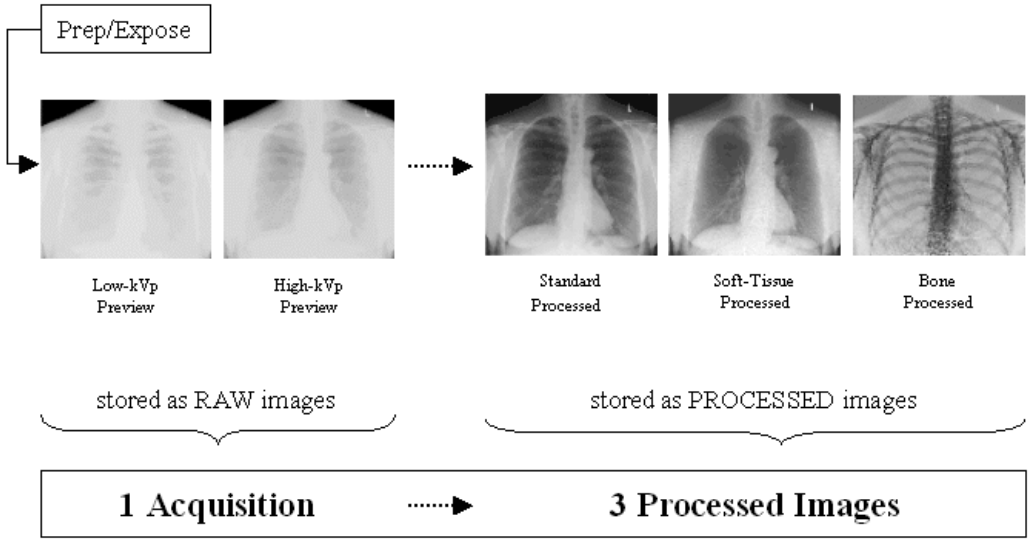
Acquisition and Images

Figure 13-1 Acquisition and Images



General Guidelines

Dual Energy acquisition and processing algorithms are optimized for Chest AP/PA and Abdomen AP/PA on adult patients. Use of Dual Energy imaging on other anatomical views and/or pediatric patients may result in degraded image quality.

For Dual Energy acquisitions, it is particularly important for the patient not to move or breathe during the exposure. Excessive whole-body patient motion can result in residual rib contrast in the soft-tissue image.

The Prep/Expose button should be released only after the end of the second exposure beep. Beware that sometimes for large patients, the two beeps merge into one and you hear one long beep. Release the Prep/Expose button after the beep ends.

Technique Settings and Image Quality for Chest Exams

Patient Size

The selection of appropriate patient-size setting is needed for:

- correct patient dose allocation between the two exposures
- optimal image quality

The recommended thickness ranges are:

- Small Adult - when the patient measures less than 22 cm.
- Medium Adult - when the patient measures between 22 cm and 27 cm.
- Large Adult- when the patient measures more than 27 cm.

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High kVp

Can be set anywhere between 110 and 150. This is usually set to that of the standard (non-DE) chest protocol/technique.

Low kVp

Can be set anywhere between 60 and 80. In general, a lower low-kVp (default is 60) will result in better “tissue cancellation”. However, for large patients, slightly increasing the low kVp (e.g., to 65 or 70) may improve x-ray penetration and consequently improve the noise characteristics of the resulting soft-tissue and bone images.

Copper Filtration

Can be set to 0, 0.1 mm, 0.2 mm, or 0.3 mm. In general, less filtration will result in better “tissue cancellation”.

Grid

The processing algorithms are optimized for chest imaging with grid IN. Removing the grid may degrade image quality.

Patient Dose

Assuming correct selection of patient-size setting, the entrance dose (air-kerma) of the low-kVp exposure should be equivalent to that of the high-kVp exposure. For a typical two-view chest exam, the Lateral view dose is much higher than that of the PA or AP view. Hence, in general, the dose of a Dual Energy chest exam (low-kVp PA or AP, high-kVp PA or AP, and standard LAT) is approximately 120% to 130% that of a non-Dual Energy chest exam (high-kVp PA or AP and standard LAT).

Dose estimates are not provided for Soft-Tissue and Bone images, since these images are not acquired but derived (created by image processing algorithms). Dose estimates are provided for the acquired (High-kVp and Low-kVp) images of a Dual Energy acquisition.

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Technique Settings and Image Quality for Abdominal Exams

When performing a dual energy exam on the abdomen, set the low and high kV value and the mA for low kV exposure. The system calculates the mA for the high kV exposure.

For abdominal exams, the system uses low kV exposure as the standard processed image (for chest exams the high kV exposure is used).

Patient Size

The selection of appropriate patient-size setting is needed for:

- correct patient dose allocation between the two exposures
- optimal image quality

The recommended thickness ranges are:

- Small Adult - when the patient measures less than 22 cm.
- Medium Adult - when the patient measures between 22 cm and 27 cm.
- Large Adult- when the patient measures more than 27 cm.

High kVp

Can be set anywhere between 110 and 150. This is usually set to that of the standard (non-DE) chest protocol/technique. In general, a higher high-kVp (default is 120) will result in better “tissue cancellation”. However, for large patients, slightly increasing the high kVp (e.g., to 130 or 140) may improve x-ray penetration and consequently improve the noise characteristics of the resulting soft-tissue and bone images.

Low kVp

Can be set anywhere between 70 and 85. In general, a lower low-kVp (default is 80) will result in better “tissue cancellation”. However, for large patients, slightly increasing the low kVp (e.g., to 85) may improve x-ray penetration and consequently improve the noise characteristics of the resulting soft-tissue and bone images.

Copper Filtration

Can be set to 0, 0.1 mm, 0.2 mm, or 0.3 mm. In general, less filtration will result in better “tissue cancellation”.

Grid

The processing algorithms are optimized for abdominal imaging with grid IN. Removing the grid may degrade image quality.

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Patient Dose

Assuming correct selection of patient-size setting, the entrance dose (air-kerma) of the high-kVp exposure should be approximately 20% to that of the low-kVp exposure. Hence, in general, the dose of a Dual Energy abdominal exam (low-kVp PA or AP, high-kVp PA or AP) is approximately 120% that of a non-Dual Energy abdominal exam (low-kVp PA or AP).

Dose estimates are not provided for Soft-Tissue and Bone images, since these images are not acquired but derived (created by image processing algorithms). Dose estimates are provided for the acquired (High-kVp and Low-kVp) images of a Dual Energy acquisition.

Dual Energy Image Processing Preferences

Using the Image Processing Preferences editor, separate look attributes (including brightness, contrast, and edge sharpness) can be selected/customized for standard, soft-tissue, and bone images, with the following exceptions:

- Noise Reduction selection is not applicable to Soft-Tissue or Bone images since these types of images already have specialized processing that includes noise suppression.
- Even though Tissue Equalization (TE) can be applied to a Bone image, its application to this “non-standard anatomy” may cause variability in image brightness. It is recommended that TE be turned off (strength and area set to zero) for Bone images. Refer to *Chapter 12: Set Preferences-Tissue Equalization Overview* (p. 12-38) for more information.

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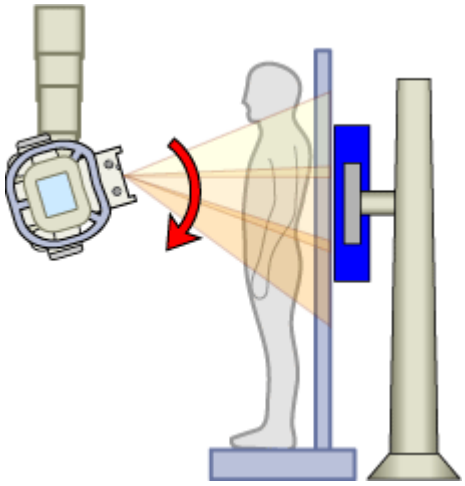
Image Pasting

Overview

Image Pasting is an advanced application that allows x-ray imaging of patient anatomy, such as spine and legs, that are larger than the current detector's 41cm field of view. Previously, in film or CR, this was accomplished by the use of a "long" cassette.

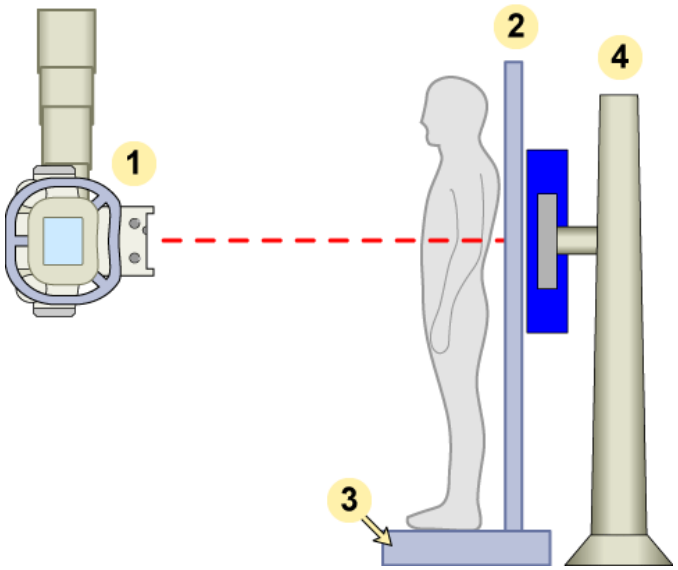
The Definium 8000 acquires 2–5 exposures in sequence then digitally pastes them together to form a single image.

Figure 13-2 Illustration of acquisition



The red arrow indicates the progress of tube movement as images are acquired.

Figure 13-3 Overall setup for image pasting



1. X-ray tube
2. Patient Positioner
3. Riser
4. Wall stand

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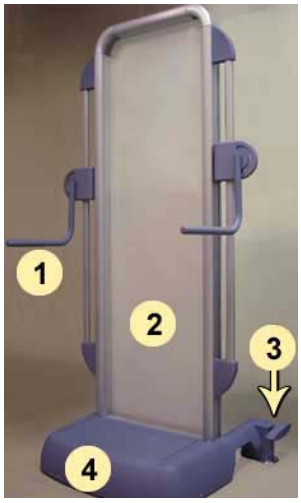
Image Pasting Patient Positioner

The patient positioner (Figure 13-4) is used to determine the correct Center of Interest (COI) and to accurately re-construct images.

Rulers are provided on the riser and on the lateral positioning bars to determine the COI.

NOTE: The maximum weight the patient positioner can support is 204kg (450 lbs.).

Figure 13-4 Patient positioner



1. Lateral positioning bars
2. Mylar backing
3. Floor locks (one on each side)
4. Riser

Lock Positioner in Place

The positioner locks into place in front of the wall stand receptor. Locking the positioner ensures that it is at the appropriate distance from the receptor, that it will not move during acquisition, and that the patient does not fall.

CAUTION: Lock both sides of the positioner before allowing the patient to stand on the riser. The positioner could move and cause the patient to fall.

CAUTION: The receiving holes in the floor may collect debris or catch the heel of a shoe. Use the provided plugs (Figure 13-5) to fill the receiving holes when the positioner is not in use.

Figure 13-5 Floor plug

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1. Align positioner with the receiving holes in the floor.

Figure 13-6 Positioner and receiving hole

2. Push the lock lever down so that the pin goes into the hole (Figure 13-7).

Figure 13-7 Lock lever pushed down

3. Push the back of the lock lever down to lock (Figure 13-8).

Figure 13-8 Lever in locked position

4. Lock the other side.

NOTE: When the positioner is not being used, unlock one side and rotate the positoner out of the way. This will save you time and space for storing the positioner.

5. Unlock the positioner by pressing the front of the lock lever down (so that it is horizontal, as show in Figure 13-7) and letting the lever rise up.

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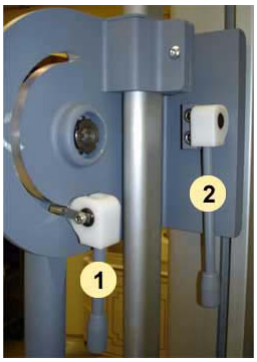
Move Lateral Positioning Bars

There are two locks on the back of the lateral positioning bars (Figure 13-9): to rotate the bar and to adjust the vertical placement.

Figure 13-9 Lateral Positioning Bar locks



1. Rotation lock lever
2. Vertical adjustment lock lever

1. Pull the lock lever 90° from its locking position (Figure 13-10).

Figure 13-10 Levers in the unlocked position

Rotation

Vertical adjustment

2. Move the lateral positioning bar to the desired height or rotation.
3. Place lock lever back into the locked position (Figure 13-9).

Image Pasting Acquisition

To acquire pasted images, you must define the top and bottom of the coverage area. The system calculates the number of images required to create the pasted image once the coverage area is defined.

During acquisition, the tube and receptor move into position to expose the top of the coverage area. The tube and receptor automatically move into position to acquire the exposures. Exposures will always begin at the top of the coverage area and move downward in sequence.

Image Pasting is only used with the wall stand receptor.

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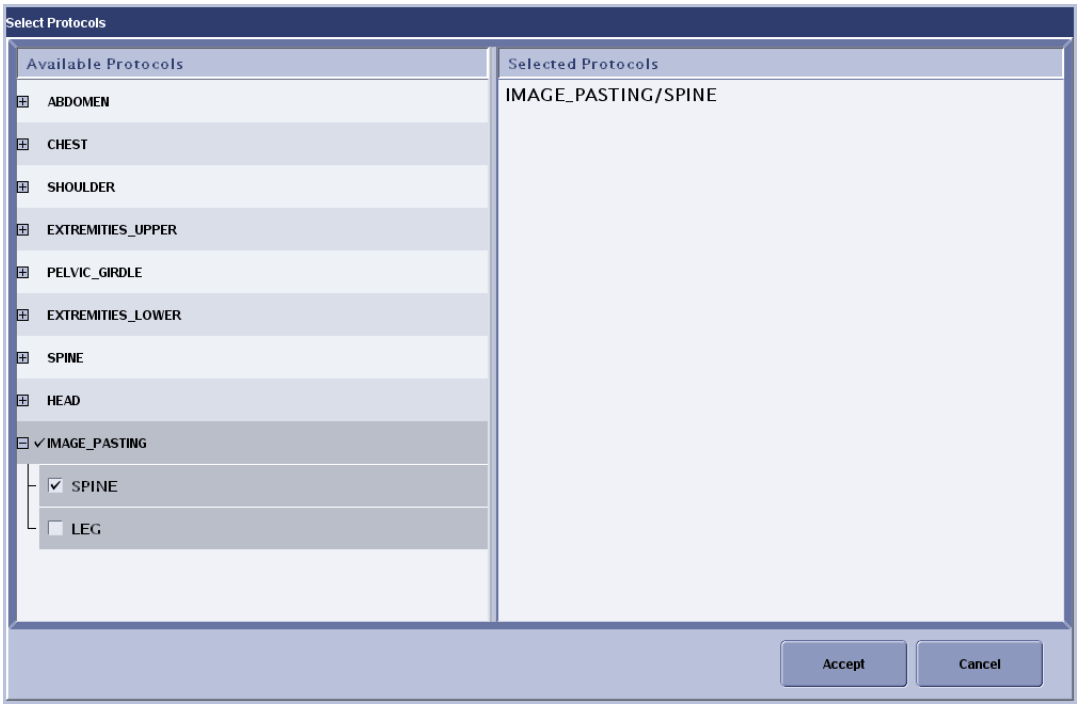
Follow this process to conduct an Image Pasting exam.

1. Place the patient positioner in front of the wall stand and secure the floor locking mechanism. Refer to *Lock Positioner in Place* (p. 13-8) for more information.
2. Select the patient from the Worklist (or add patient if necessary).
3. Select the Image Pasting protocol from the Select Protocols screen (Figure 13-11).
   a) Select the Image Pasting category.
   b) Select the Exam (Spine or Leg).
4. Click [ACCEPT].

Figure 13-11 Protocol selection for Image Pasting



5. On the Acquisition screen (Figure 13-12), select the view to perform.

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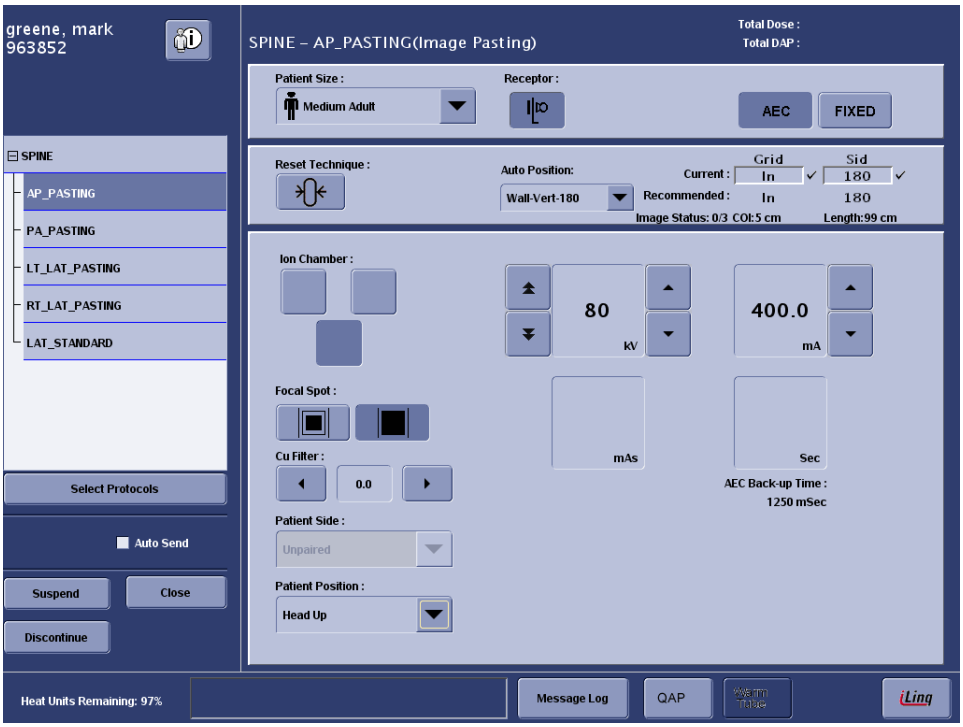
Figure 13-12 Acquisition screen for image pasting—before acquisition



6. Select the **Patient Size**.
7. Adjust the technique on the Acquisition screen.

NOTE: Settings are applied to all acquired images.

- There is no “asymmetric collimation” selection.
- The [RESET TECHNIQUE] button resets to default technique for selected application. [RESET TECHNIQUE] will reset HEAD and FOOT coverage areas; therefore, you must redefine the coverage area.

8. Position the tube at the appropriate SID.
   - If your system has auto positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING and POWER buttons on the RCIM until the tube stops moving. The system will beep and a message will appear in the Message Log area to confirm that the tube is in place. Refer to *Auto Positioning* (p. 13-28) for more information.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position.

9. Stand the patient in front of the patient positioner.

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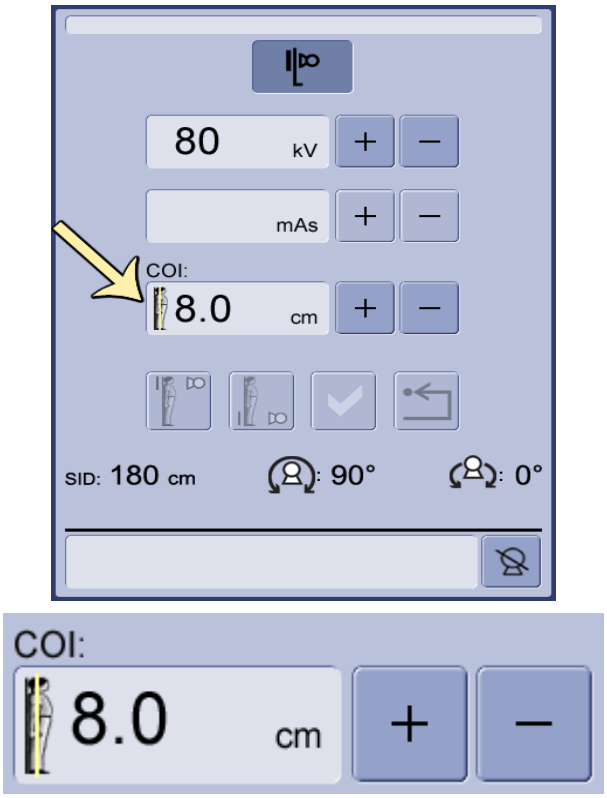
10. Determine the Center of Interest (COI) with the ruler included on the patient positioner.
11. Enter the COI value on the OTS control screen. Press the [+] and [-] buttons on the OTS control screen to enter the COI (Figure 13-13).

Figure 13-13 COI on OTS control screen



12. Activate the detents.
13. Instruct the patient to close his or her eyes.
14. Turn on the collimator light.

WARNING: Laser radiation. Peak power 1 mw / wave length 540-700 nm / class II laser product. Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision.

15. Aim laser light at top of desired image field (Figure 13-14).
    - You may do this by either angulating the tube or by keeping the tube at 90° and moving the column vertically.

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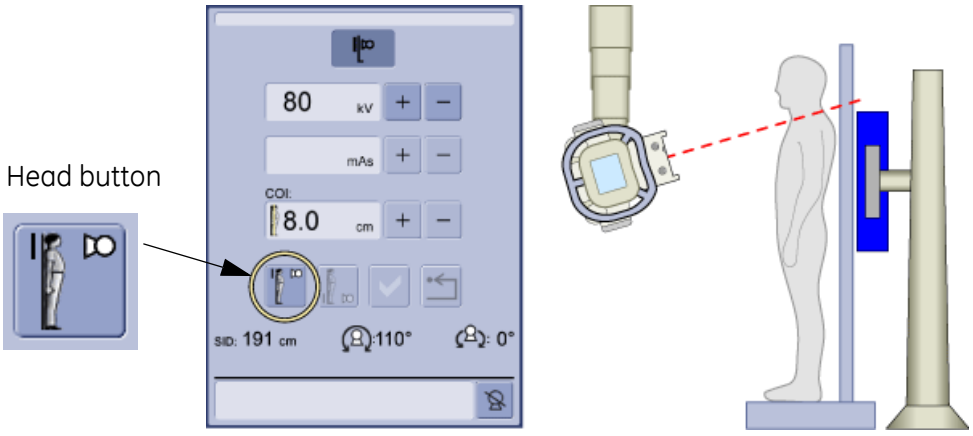
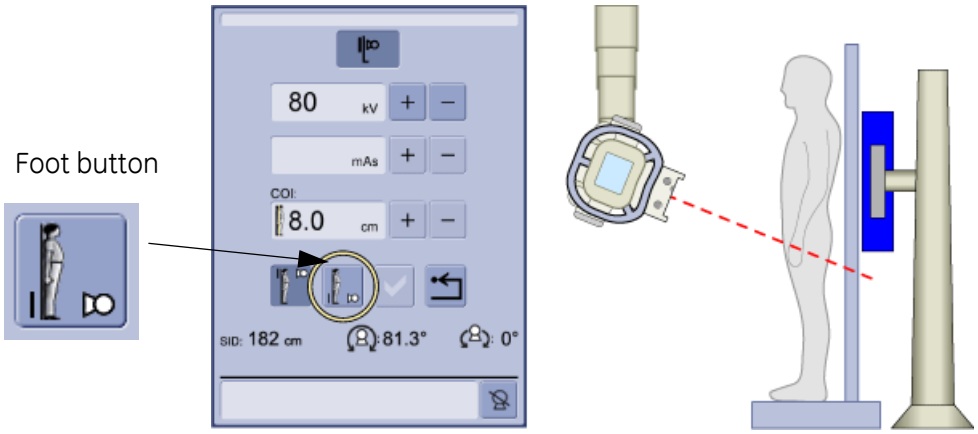
16. Press [HEAD] on the OTS control screen (Figure 13-14).
    - If the [HEAD] button does not become enabled, check the following:
      - Is the OTS in lateral detent of the wall stand receptor? If not, reposition the tube to lateral detent.
      - Is the column rotated? Column rotation should be 0°.
      - Is the system in OVERRIDE mode? System should be in NORMAL mode.

Figure 13-14 Define top of coverage area



17. Aim laser light at the bottom of the desired image field (Figure 13-15).
    - You may do this by either angulating the tube or by keeping the tube at 90° and moving the column vertically.
18. Press [FOOT] on the OTS control screen (Figure 13-15).

Figure 13-15 Define bottom of converge area



NOTE: Press [RESET] on the control screen (Figure 13-16) to erase the COI, HEAD, and FOOT settings.

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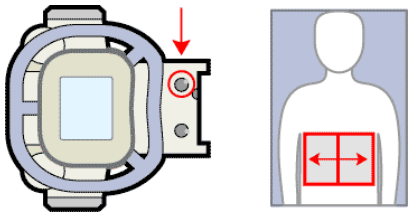
Figure 13-16 [RESET] button

19. Adjust the lateral collimation.

Figure 13-17 Collimate for exam



NOTE: Image Pasting registration can cause narrowing of the field. Do not collimate in too tightly.

20. Press the [SET] button (Figure 13-18) on the OTS control screen when finished.

Figure 13-18 [SET] button

NOTE: The wall stand detector, tube, or both may move. Warn the patient to hold still.

- If the area is not within the acceptable range for the protocol, the [HEAD], [FOOT], and [SET] buttons become disabled and a message appears in the status area. Press [RESET] and start over.
- Once you press [SET], the lateral and vertical collimation knobs on the OTS are locked out. That is, turning the knobs will not change the collimation.
- Once you press [SET], if you change the SID or Tube angle, you will need to re-press the [SET] button before acquisition is allowed.
- Moving the tube out of lateral detent will inhibit exposures until the tube is re-positioned.
- Press the OTS control screen (Figure 13-19) or the Emergency Stop button on the RCIM to stop the tube movement.

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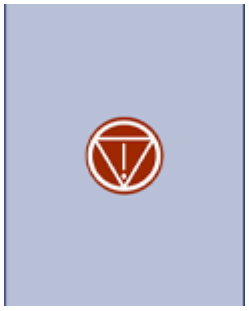
Figure 13-19 Stop tube movement from OTS control screen



21. Make exposure using the hand switch.

    - Hold the exposure button down until all exposures have been made. The Image Count area under the SID and Grid information counts down each image as it is exposed (Figure 13-20). Releasing the switch early will terminate image pasting processing. Any acquired images will still be able to be manually pasted. Refer to *Re-paste* (p. 13-20) for more information.

Figure 13-20 Image Status on Acquisition screen

    - The sub-images appear on the Viewer screen as they are acquired and a pasted image appears approximately 10 seconds later.

Alternate Image Pasting Acquisition Workflows

The following sections provide instructions for the acquisition of specific anatomy.

Legs

Improper COI determination on Leg anatomy may result in no image below the ankle. The following process correctly the determines the COI for Leg anatomy and results in a complete image.

NOTE: This process is for Image Pasting on the Leg anatomy only. COI determination and patient positioning for the Spine anatomy remains the same.

1. Position the patient as far posterior on the riser as is comfortable (there is no need to have the patient's heel touching the mylar backing of the patient positioner).
2. Determine the COI at a point that is just posterior to the lateral malleolus.
3. Enter the COI value on OTS screen.

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4. Set the HEAD and FOOT positions with the tube stand at approximately the midpoint of what will be the tube travel (typically **knee height** of the patient) using the laser light/tube angle method.
5. Set the HEAD center point, using the laser light, slightly HIGHER than normal (i.e., 5 cm—or 2 in—above the top of the anatomy you intend to acquire—e.g. iliac crest).
6. Set the FOOT center point as low as possible to intersect just below the ankle joint.
7. Press [SET].
   - If you receive an error after pressing [SET], reposition the patient, check the accuracy of the COI, and repeat steps 4-7.
8. Complete setup and acquisition as described in *Image Pasting Acquisition* (p. 13-10).

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Image Viewer

Each acquired image is a “sub-image.” After the sub-images are processed, the system aligns and pastes the sub-images into a single “composite” image. The pasted composite is one long image that has continuous anatomical content with the same processing applied throughout.

The following images are stored for the exam and are available for viewing:

- The acquired raw sub-images in the “RAW” series (2–5 images, depending on the protocol and the size of the coverage area)
- The processed sub-images in the “PROC” series (1 processed image for each raw image)
- 1 processed pasted composite image in the “PROC” series (no “raw” pasted composite images are displayed or stored)
- Any re-processed sub-images or re-pasted sub-images and pasted composite images in the “PROC” series

All image zoom, annotation, adjustment tools (brightness, contrast, windowing, rotation, etc.), and re-processing are available for the pasted composite image and the sub-images. The controls function the same as for non-pasting acquisitions. Refer to *Chapter 7: Image Viewer* for more information about image adjustment.

The pasted composite image is treated as one image entirely. Image adjustments are applied equally to the entire pasted composite image.

NOTE: DEI is not shown for derived images. This includes Dual Energy subtraction images (soft tissue and bone) and pasted composite images.

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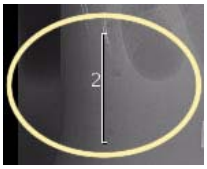
View Pasted Composite Image

The pasted composite image (Figure 13-21) appears automatically after acquisition and processing is complete.

Figure 13-21 Image Viewer screen with pasted composite image

The registration markers (brackets) show the general area of pasted overlap (Figure 13-22). Use the Image Magnifying Glass function to review registration quality.

Figure 13-22 Close-up of registration marker



Select Images

The Exam/Series palette shows two kinds of series:

- Raw images – the individual sub-images that were acquired.
- Processed images – one processed image for each raw image plus one pasted composite image

Re-pasting adds 1 re-processed sub-image for every raw image and 1 pasted composite image to the same processed series.

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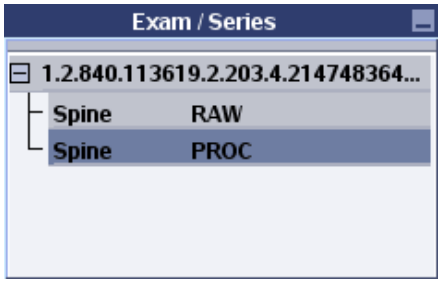
Figure 13-23 Exam/Series palette



Re-Process Images

The Image Processing tab of the Image Tools palette (Figure 13-24) contains the tools to re-process and repaste sub-images and pasted images.

Refer to *Change Looks Processing (Vertical Equalization)* (p. 13-23) or more information.

Figure 13-24 Image Tools palette – Image Processing tab

Re-paste

Re-pasting allows you to manually correct the alignment of the sub-images and create a new composite image.

Re-paste is used in the following situations:

- If the exposure was ended before all acquisitions were taken (therefore the system could not process the sub-images into a pasted composite image).
- If the pasted composite image is not properly aligned.

The Re-pasting screen (Figure 13-26) is accessed by clicking the [REPASTE] button (Figure 13-25) on the Image Tools - Image Processing tab.

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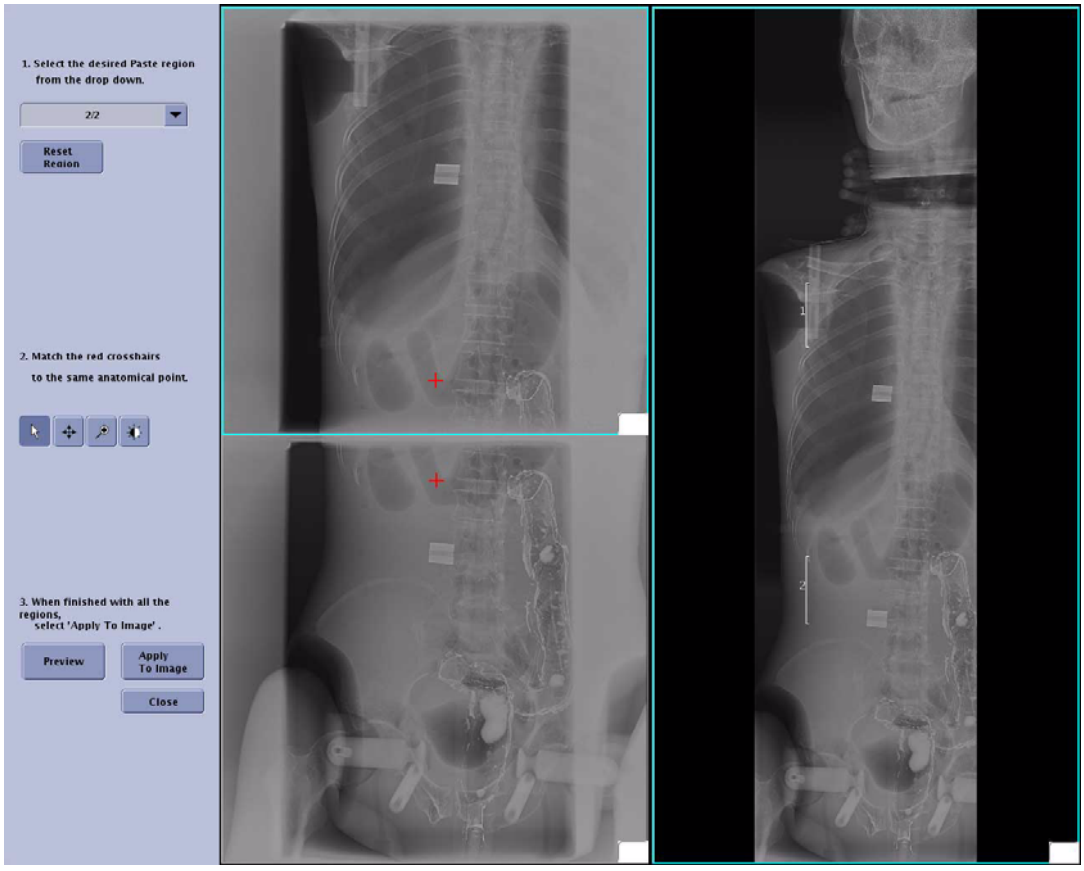
Figure 13-25 Re-paste button

The Re-pasting screen shows two sets of images. The left half shows the selected pasting region (the overlapped area between 2 sub-images). The left half is also the work area where you set the alignment. The right half shows a preview of the pasted image.

Figure 13-26 Re-pasting screen


1. Select the desired Paste region from the drop down.
2/2
Reset Region
2. Match the red crosshairs to the same anatomical point.
3. When finished with all the regions, select 'Apply To Image'.
Preview
Apply To Image
Close

Follow this process to manually re-paste images.

1. On the Image Tools palette, click the Image Processing tab.
2. Click the [REPASTE] button.

NOTE: It may take a few moments for images to appear.

3. Select a region to re-paste from the drop-down list (Figure 13-27). For example: 1/2, 2/2.
   - [RESET REGION] removes any manual re-pasting from the selected region.

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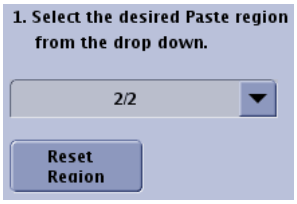
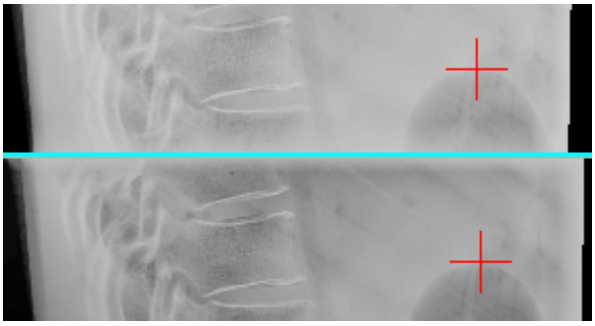
Figure 13-27 Select region drop-down list.



4. Click and drag on a red cross-hair to move it (Figure 13-28).

Figure 13-28 Cross-hairs



5. Place the cross-hairs at the same anatomical reference point on image.
   - The mouse control buttons (Figure 13-29) change the action of the cursor when used on images. Refer to *Chapter 7: Image Viewer-Change Mouse Controls* (p. 7-23) for more information about these functions.
   - Use the Image Magnifying Glass on a region image to zoom in on anatomical regions for better cross-hair placement.

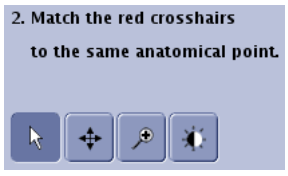
   a) Click the [IMAGE MAGNIFYING GLASS].

   b) Click and drag the mouse on a region image to select an area to magnify.

      – The image size will increase in proportion to the selected area.

   c) To remove magnification, double-click the magnified image.

Figure 13-29 Mouse controls



6. Repeat steps 3–5 for all regions, if necessary.
7. Click [PREVIEW] to check the registration (Figure 13-30).

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NOTE: Preview is only to check image alignment. Full image processing parameters are not applied to the preview.

NOTE: It may take several moments for the preview to appear on the right half of the screen.

Figure 13-30 Preview and Apply to Image buttons

8. When satisfied with image alignment, click [APPLY TO IMAGE] (Figure 13-30).
   - [APPLY TO IMAGE] initiates the system to perform the following tasks:
     - Apply the new registration and all processing
     - Re-process sub-images (creates new sub-images)
     - Create new pasted composite image
     - Add re-pasted images to the existing processed series
   - You will automatically be returned to the main Image Viewer screen.
9. Click [CLOSE] to leave the manual re-pasting screen and return to the Image Viewer screen if you do not want to apply registration to the image.

Change Looks Processing (Vertical Equalization)

A custom look can be changed or applied through the Image Processing Preferences Editor screen.

Refer to *Chapter 12: Set Preferences-Build Custom Looks* (p. 12-34) for more information about looks processing.

For Image Pasting acquisitions, the Image Processing Preferences Editor allows adjustment of vertical equalization strength.

1. Select the **Image Processing Tab** from the Image Tools palette.
2. Click [EDIT PROC].
   - The Image Processing Preferences Editor screen (Figure 13-31) appears on the left monitor.
3. Select an undefined custom look from the **Look** drop-down.
4. Enter a name for the **Look Description**.

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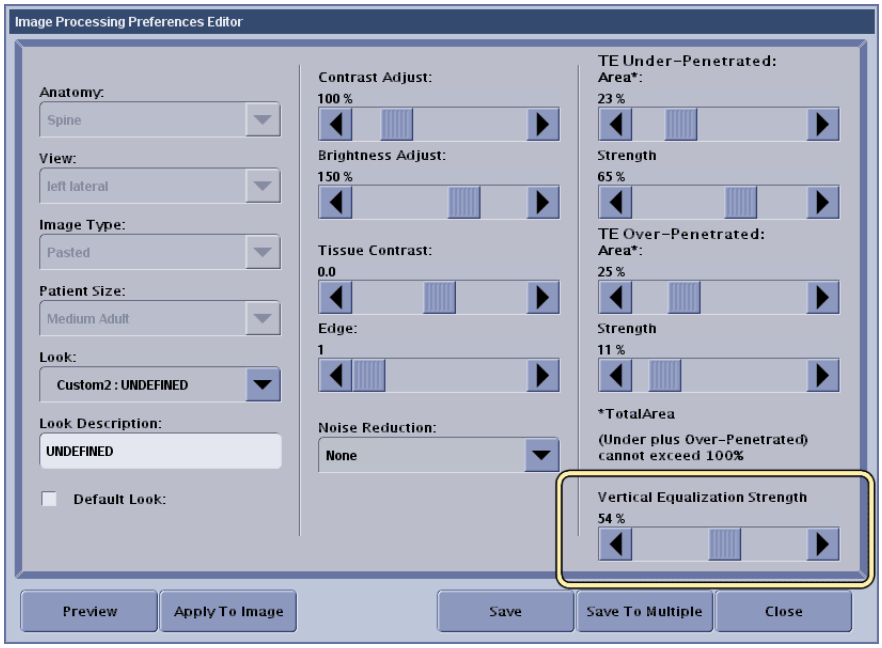
5. Adjust the parameters as described in *Chapter 12: Set Preferences-Build Custom Looks* (p. 12-34).
6. Adjust the **Vertical Equalization Strength**.
7. Click [PREVIEW] to see the effect of the changes.
   - The preview is shown on the Image Viewer screen.
   - Continue to adjust the look as necessary.
8. When satisfied with the looks processing, click [SAVE].
9. Click [APPLY TO IMAGE].
10. Click [CLOSE].

Figure 13-31 Image Processing Preferences Editor screen



Print Pasted Images

The process for printing images from an Image Pasting acquisition is the same as for standard images. Refer to *Chapter 7: Image Viewer-Print Images* (p. 7-24).

You have the option to preview before printing. If the print size of the pasted composite image is larger than can be printed on a single piece of film or paper, the preview will show multiple pages.

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Image Pasting Preferences

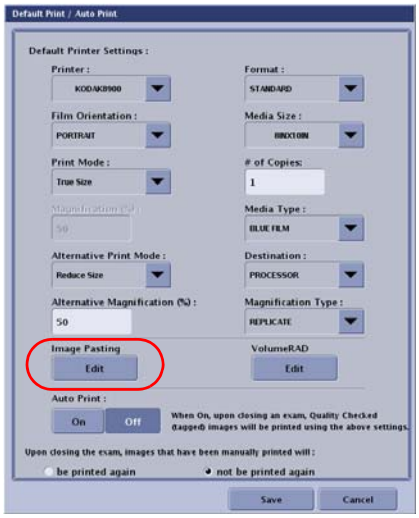
This section covers the preferences setting specific to Image Pasting. All other settings are as described in *Chapter 12: Set Preferences*.

Configure Default Print/Auto Print Settings

Print setting for Image Pasting are accessed from the Image Management preferences, Auto Print settings.

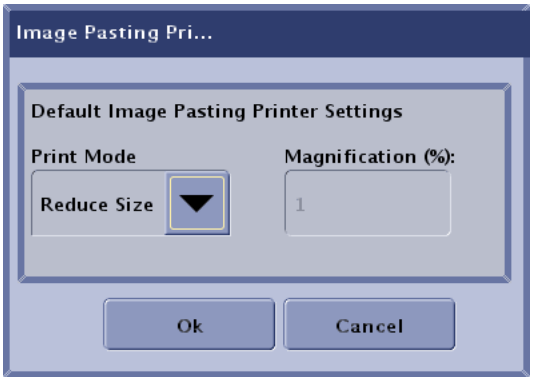
1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
   - The Default Print/Auto Print screen (Figure 13-32) appears.

Figure 13-32 Default Print / Auto Print screen



4. Click Image Pasting [EDIT].
   - The Image Pasting Print screen (Figure 13-33) appears.

Figure 13-33 Image Pasting Print screen



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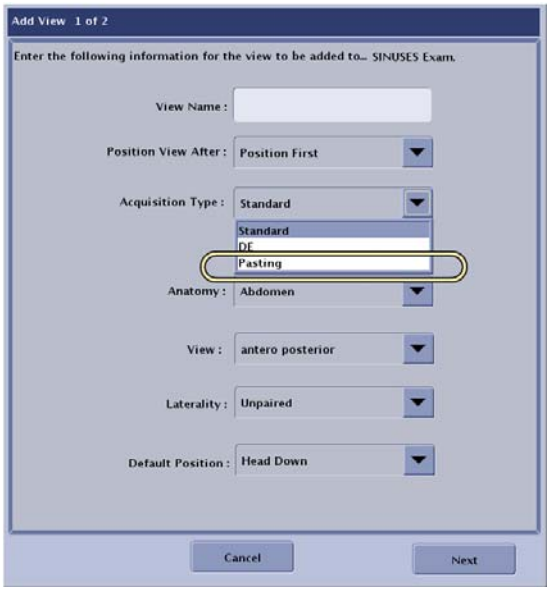
5. Select the Print Mode from the drop-down list.
   - Available options are:
     - True – prints image in actual size across multiple films
     - Fit-to-film – fits the image to the selected film size
     - Reduce size – prints images with the displayed Magnification (%) factor
     - Orthopedic Print – if Orthopedic Magnification is enabled, applies a pre-configured magnification factor to the image
     - None – will not print composite images
6. Click [OK] to apply the setting.
   - [CANCEL] closes the screen without changing the setting.
7. Complete the Default Print/Auto Print screen as described in *Chapter 12: Set Preferences-Auto Print* (p. 12-18).

Add or Edit Image Pasting Protocols

Protocol editing for image pasting (Figure 13-34) is similar to standard exams except for the following differences:

- Select an **Acquisition Type** of **Pasting**

Figure 13-34 Add View screen (1 of 2)



- There is no table or cassette receptor option.

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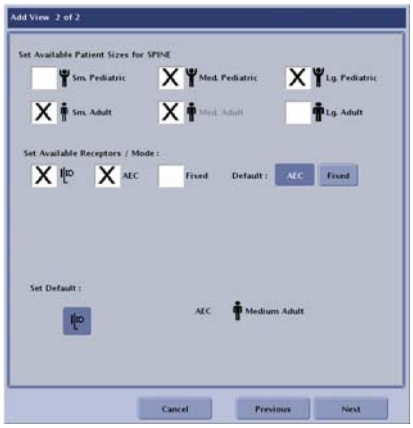
Figure 13-35 Add View screen (2 of 2)



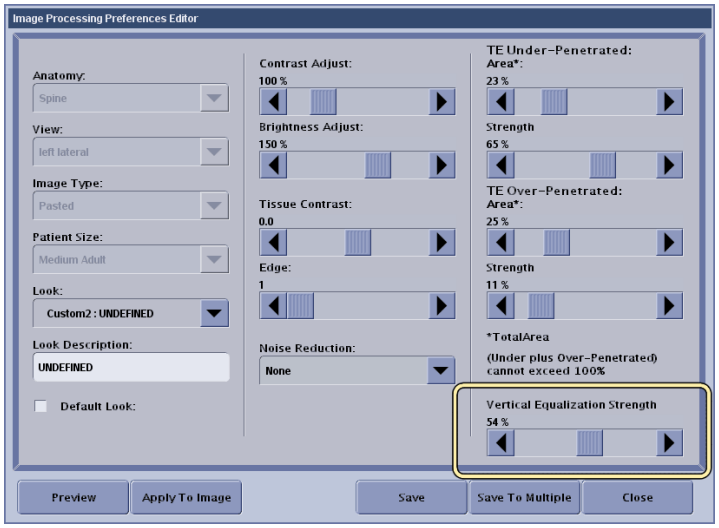
Edit Image Processing

The Image Processing editor allows you to select an **Image Type** of "Pasted" for specific anatomy and views.

- The Image Type "Pasted" is only available if one of the following **Anatomy** is selected:
  - Spine
  - Legs
- The only **Views** that allow image pasting processing are:
  - Spine: AP, PA, Left LAT, and Right LAT
  - Legs: AP and PA

The Vertical equalization strength slider appears (Figure 13-36) if "Pasted" is selected for the Image Type.

Figure 13-36 Image Processing Preferences Editor screen



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Auto Positioning

Overview

Auto Positioning assists you with the major positioner movements. You then adjust the position as needed for the exposure.

Auto Positioning incorporates angulation of the tube, longitudinal, lateral, rotational and vertical positioning of OTS, table detector longitudinal positioning, wall stand detector vertical positioning. Wall stand tilting is also available. Where possible, simultaneous movements will be used to reduce the positioning time.

Auto Positioning is compatible with the following system configurations:

- Table only
- Wall stand only (including extendable arm wall stands)
- Both table and wall stand (including extendable arm wall stands)

WARNING: Keep patient and any others in room clear of the OTS as it moves into position. The area 180cm in front of the wall stand should be kept clear during Auto Positioning.

OTS

The OTS has motorized motion for the following axes: Longitudinal, Lateral, Vertical, Column Rotation, and Tube Angulation.

If the distance to the final predefined OTS longitudinal and lateral positions is less than 100mm, the OTS moves directly to all predefined positions.

If the distance to the final predefined OTS longitudinal and lateral positions is greater than 100mm, the OTS moves vertically to within 100mm of the highest position before moving the longitudinal, lateral, column rotation and tube angulation axes to their final predetermined positions.

Once the lateral and longitudinal axes are within 100mm of their final positions, the vertical axis can begin motion to its final position.

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RCIM

An AUTO POSITIONING button is provided on the RCIM (Figure 13-37).

Pressing and holding the AUTO POSITIONING and POWER buttons at the same time enables positioner motion.

- If either button is released at any time during the motion, all movement stops.
- If both buttons are reactivated, motion will resume from where it stopped.

Figure 13-37 AUTO POSITIONING and POWER buttons on RCIM

Pre-defined Positions

There are seven pre-defined positions. These positions may be defined as the default position for a view or be selected from the Worklist and Acquisition screens.

The pre-defined positions are:

- WS-Vert-180 (Wall stand receptor, vertical orientation, SID at 180 cm)
- WS-Vert-100 (Wall stand receptor, vertical orientation, SID at 100 cm)
- WS-Horz-100 (Wall stand receptor, horizontal orientation, SID at 100 cm)
- WS-Stretcher-100 (Extendable Arm Wall stand receptor, SID at 100 cm)
- Table-Head-100 (Table receptor, over Head position, SID at 100 cm)
- Table-Center-100 (Table receptor, over Center position, SID at 100 cm)
- Table-Foot-100 (Table receptor, over Foot position, SID at 100 cm)
- Park (Service personnel configure this position to the facility's specification)

NOTE: These are the default positions. Your facility may define up to 10 additional custom positions. Custom positions are entered by GE Service personnel through the Services interface.

Figure 13-38 Auto Position drop down with custom position

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Auto Positioning Messages

Several different messages appear in the System Status Area when Auto Positioning is in progress. The messages and the conditions that they describe are shown in Table 13-1.

Table 13-1 Auto Positioning conditions and messages

Condition	Message
Auto Positioning motion has begun.	"Auto Position in Progress"
Auto Positioning motion has completed (successful). **NOTE:** A beep will also sound when the motion is complete.	"Auto Position Complete"
Auto Positioning motion stopped because the switch was released early.	"Auto Position Stopped: early switch release"

Initiate Auto Positioning

Auto Positioning is available both during and outside of live exams.

You can start Auto Positioning from the Acquisition workstation:

- Worklist screen - With the patient exam closed, the Worklist screen provides an Auto Position selection for Wall stand, Table, or Park.
- Image Acquisition screen - With the patient exam open, each valid protocol is mapped to one of the predefined positions as defined in the protocol.

In either situation, pressing and holding the AUTO POSITIONING and POWER buttons on the RCIM initiates motion toward the predefined position.

Auto Positioning from Worklist Screen

Follow this process to initiate Auto Positioning from the Worklist.

1. Confirm or change the **Auto Positioning** selection (Figure 13-39).
   - The available options are:
     - Table-Center-100
     - Wall-Vert-100
     - Wall-Vert-180
     - Park
     - Any custom positions

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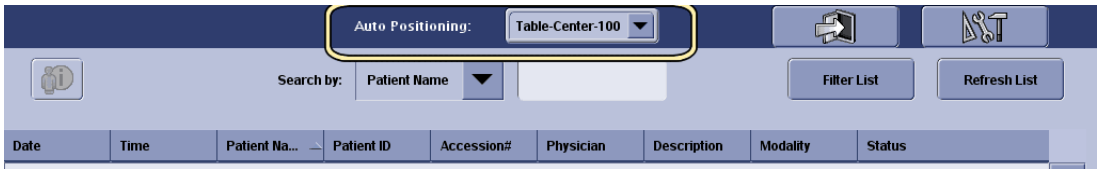
2. Press and hold the AUTO POSITIONING and POWER buttons on the RCIM until you hear the beep or see the message “Auto Position Complete” in the System Status Area.
   - The OTS begins moving into the selected position 1–2 seconds after pressing the buttons.
   - If either button is released at anytime, motion is disabled and the locking function is applied.
   - If applicable, the wall stand detector moves to its predefined position.

NOTE: Auto tracking of the OTS to the wall stand will not be enabled until the Auto Positioning is completed or a wall stand or OTS lock button is pressed.

3. Continue to begin the exam as described in *Chapter 6: Image Acquisition*.

Figure 13-39 Worklist screen with Auto Positioning control



Auto Positioning from Image Acquisition Screen

Follow this process to activate Auto Positioning from the Image Acquisition screen.

1. Select the patient procedure from the Worklist or add the patient to the Worklist.
2. Select the exam and view to perform.
3. Adjust exam techniques as appropriate.
4. Position the patient on the table or in front of the wall stand as appropriate.
5. Confirm or change the **Auto Position** selection (Figure 13-40).
   - The available options are determined by the selected protocol and view.
6. Press and hold the AUTO POSITIONING and POWER buttons on the RCIM until you hear the beep or see the message “Auto Position Complete” in the System Status Area.
   - The OTS begins moving into the selected position 1–2 seconds after pressing the buttons.
   - If either button is released at anytime, motion is disabled and the locking function is applied.
   - If applicable, the wall stand moves to its predefined position.

NOTE: Auto tracking of the OTS to the wall stand will not be enabled until the Auto Positioning is completed or a wall stand or OTS lock button is pressed.

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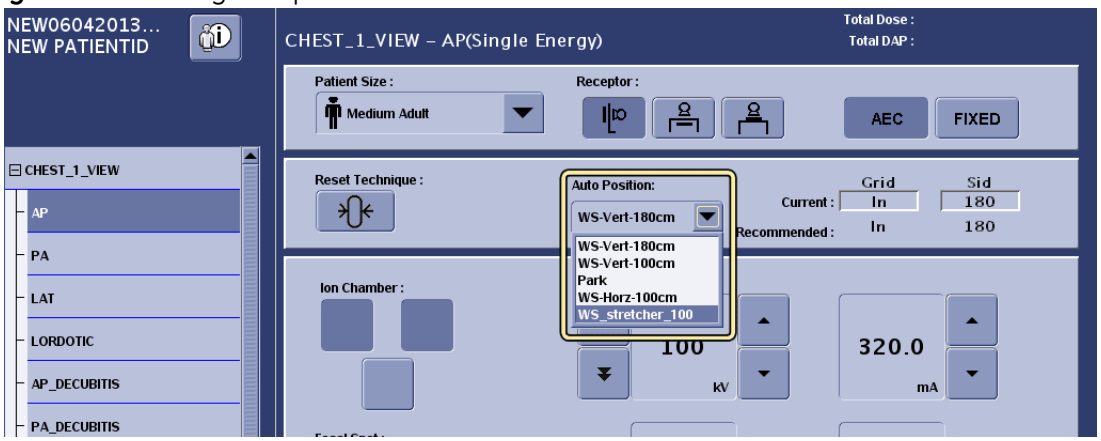
7. After motion stops, make final adjustments to the tube position, if necessary.
8. Continue the exam as described in *Chapter 6: Image Acquisition*.

Figure 13-40 Image Acquisition screen with Auto Position control



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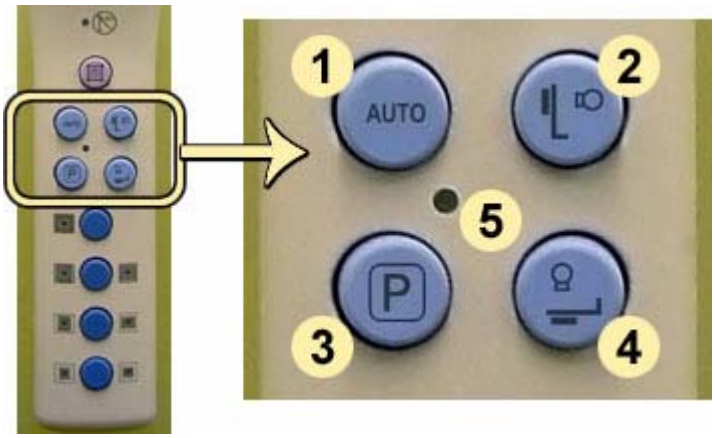
Auto Positioning from Wall Stand Hand Control

Auto Positioning may be activated from the wall stand hand control. Use the auto positioning buttons (Figure 13-41) to select the position and begin moving the tube.

Figure 13-41 Wall stand Auto Position control buttons



1. Auto Position
2. Wall stand
3. Park
4. Table
5. Auto Position indicator light

1. Press and hold the Auto button and the button for the desired location (Wall stand, Table, or Park).
   - The Auto Position indicator light goes on.
   - It does not matter which button is pressed first or if they are pressed simultaneously.
2. Hold down both buttons until the tube reaches the selected position.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position.

   - The Auto Position indicator light will go out and the system will beep when the tube has reached the position.
   - The tube will stop moving if one or both buttons are released before the tube reaches the selected position or if another location button is pressed. Repeat steps 1 and 2 to resume tube movement.
3. Make final adjustments to the tube position, if necessary.

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Auto Positioning Preferences

This section describes the settings for configuring Auto Positioning on your system.

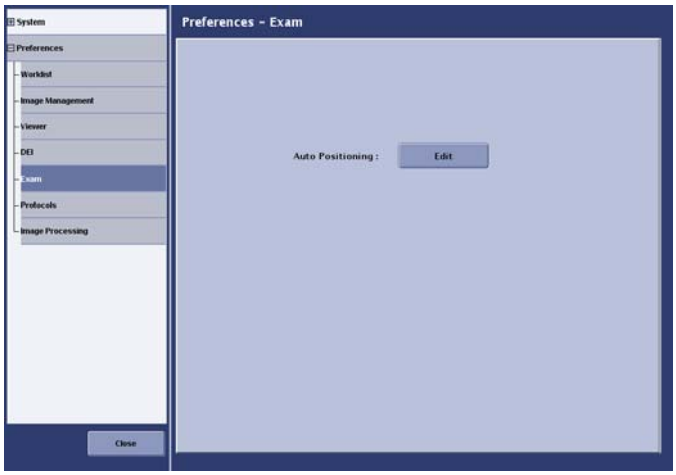
Refer to *Chapter 12: Set Preferences* for more information about other settings.

Select Default Auto Positioning for Receptors

The Exam screen allows you to set a default Auto Position for each receptor.

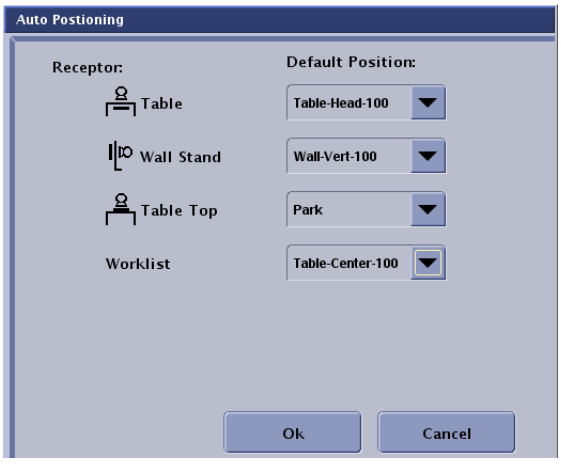
1. From the Utilities screen, open **Preferences > Exam** (Figure 13-42).

Figure 13-42 Preferences Exam



2. Click the **Auto Positioning** [EDIT] button.
   - The Auto Positioning screen appears (Figure 13-43).

Figure 13-43 Auto Positioning screen



3. Select the default position for each applicable receptor. Table 13-2 describes the available positions for the receptors.

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Table 13-2 Auto Positioning receptor selections

Receptor	Options
Table	Available options are: • Table-Head-100 • Table-Center-100 • Table-Foot-100 • Park • Any custom positions defined for this receptor
Wall stand	Available options are: • Wall-Vert-100 • Wall-Vert-180 • Wall-Horz-100 • Park • Any custom positions defined for this receptor
Table Top	Available options are: • Park • Any custom positions
Worklist	Available options are: • Table-Center-100 • Wall-Vert-100 • Wall-Vert-180 • Park • Any custom positions

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Orthopedic Magnification

Overview

Orthopedic Magnification is an option that allows you to introduce a fixed amount of magnification percentage so that the image size will match previously calibrated orthopedic templates.

This section provides instruction on printing images with Orthopedic Magnification.

NOTE: The functions described in this section are only available if Orthopedic Magnification is enabled. GE Service personnel enable Orthopedic Magnification and enter the Configurable Magnification Factor (CMF) through the Services User Interface. The CMF is the amount of magnification applied to all Orthopedic Magnification functions. Only GE Service personnel are able to change the CMF.

Only processed images will have Orthopedic Magnification applied. The raw images remain as acquired.

Print Images

The following sections describe how to print images with Orthopedic Magnification function available from the Image Viewer screen.

Print Single Image

Follow this process to print the currently selected image with Orthopedic Magnification.

1. Select the image to print.
2. Click [MANUAL PRINT].
   - The Print Images screen (Figure 13-44) appears.
3. Set the **Print Mode** to **Orthopedic**.
   - The **Magnification** field displays the CMF entered on the Services User Interface.
4. Adjust the other settings as described in *Chapter 7: Image Viewer-Print Images* (p. 7-24).
5. Click [PREVIEW] to see how the final print will appear.
6. Click [PRINT] to print the image.

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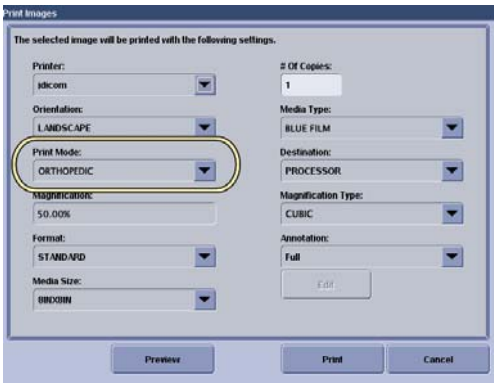
Figure 13-44 Print Images screen with Orthopedic Print Mode selected



Print Multiple Images

Follow this process to print multiple images through the Film Composer with Orthopedic Magnification applied.

1. Select the series to print.
2. Click [FILM MANAGER].
   - The Film Composer screen (Figure 13-45) appears.
3. Select the number of images to appear on each sheet.
4. Click and drag image thumbnails from the Series palette to the sheet composer area.
5. Click [PRINTER SETTINGS].
   - The Print Images screen appears.
6. Set the **Print Mode** to **Orthopedic** as described in *Print Single Image* (p. 13-36) above.
7. Print the sheet or sheets. Refer to *Chapter 7: Image Viewer-Print Images* (p. 7-24) for more information.

Figure 13-45 Film Composer screen

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Orthopedic Magnification Preferences

The following sections describe the preferences that are available to configure Orthopedic Magnification functions. Refer to *Chapter 12: Set Preferences* for more information about configuring other preferences.

Configure Default Print Settings and Auto Print

You may select Orthopedic Print as a default print setting for manual printing and auto print.

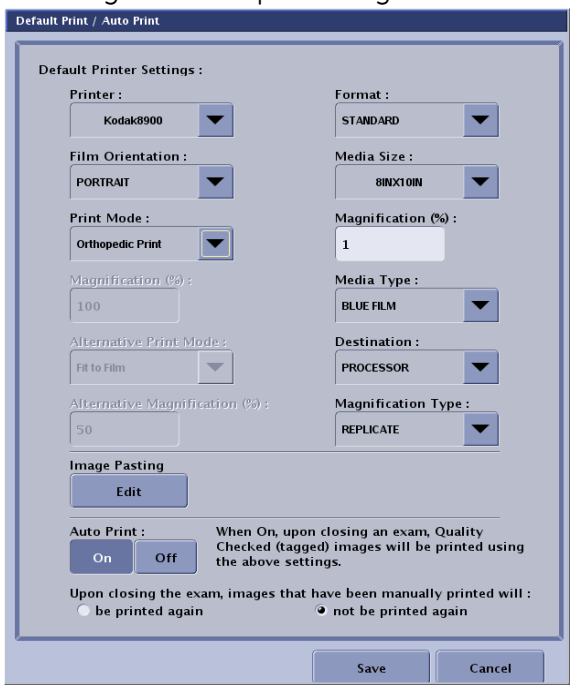
1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
   - The Default Print/Auto Print screen (Figure 13-46) appears.
4. Set the **Print Mode** to **Orthopedic Print**.

NOTE: When "Orthopedic Print" is selected as the Print Mode, Alternative Print Mode is disabled.

NOTE: When "Orthopedic Print" is selected as the Print Mode, all images printed through Auto Print will have magnification applied.

5. Click [SAVE] to retain your changes.

Figure 13-46 Auto Print settings for Orthopedic Magnification



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Appendix A
VolumeRAD™

VolumeRAD™ is a purchasable option for the Definium 8000. This appendix describes the option and provides instruction about conducting tasks that differ from standard acquisitions.

Topics covered include:

- *Overview* (p. A-2)
  - *Reconstruction* (p. A-2)
  - *Configurations* (p. A-4)
- *Safety Warnings* (p. A-6)
- *Equipment* (p. A-6)
  - *Room Layout* (p. A-6)
  - *OTS User Interface* (p. A-7)
- *Image Acquisition* (p. A-8)
  - *Protocol Selection* (p. A-8)
  - *Acquisition Chart* (p. A-9)
  - *Scout Acquisition* (p. A-15)
  - *VolumeRAD Sweep Acquisition* (p. A-18)
- *Image Viewer* (p. A-20)
  - *Adjust Images* (p. A-20)
  - *View Slices* (p. A-21)
  - *Reprocess Images (Adjust Slices)* (p. A-21)
  - *Annotate Slices* (p. A-23)
  - *Print Slices* (p. A-26)
- *Image Management* (p. A-26)
- *Preferences* (p. A-26)
  - *Protocol Editor (Scout)* (p. A-26)
  - *Reconstruction Preferences* (p. A-29)
  - *Dose Preferences* (p. A-32)
  - *Auto Printing Preferences* (p. A-34)
- *Workflow* (p. A-36)

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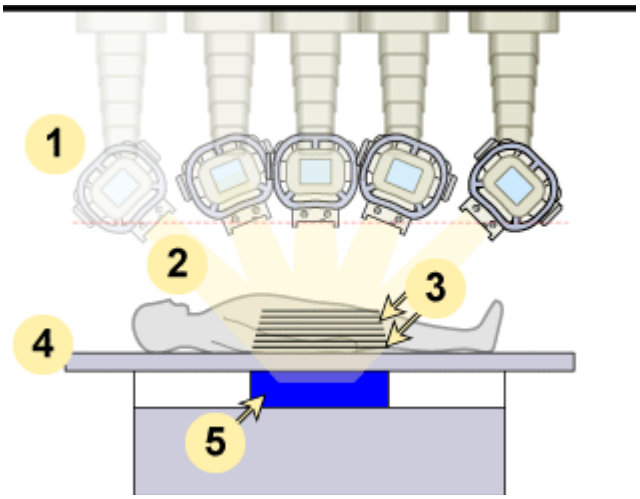
Overview

VolumeRAD (3-D radiography) involves a series of low dose exposures during a single sweep with a stationary detector and the tube moving within a limited angular range. After a VolumeRAD acquisition, the system reconstructs a number of planes (slices) parallel to the detector. These slices show anatomical structures at different depths.

VolumeRAD removes overlapping/overlying structures and enhances the conspicuity of structures in the different slices.

Figure A-1 Simplified overview of VolumeRAD acquisition and reconstruction



1. X-ray tube as it moves through the sweep
2. X-ray emissions as the tube moves through the sweep
3. Reconstructed slices
4. Table
5. Detector

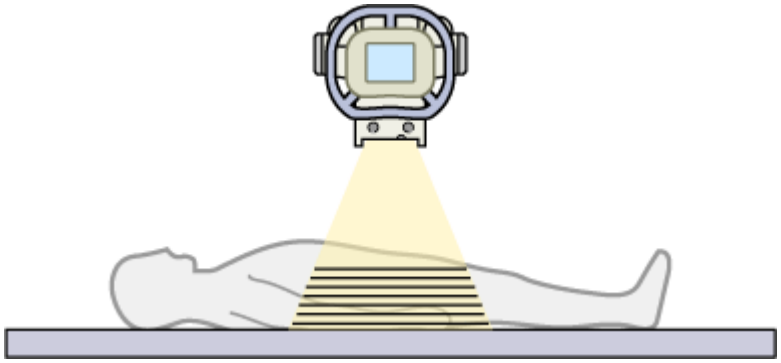
Reconstruction

Once the acquisition is complete, the system begins to process the data into slices.

Each slice is an image visualizing the anatomy at that distance from the table or wall stand surface.

The anatomy covered in a slice decreases as the distance from detector at which it is reconstructed increases. This is due to the “cone beam” effect (Figure A-2).

Figure A-2 Cone beam effect



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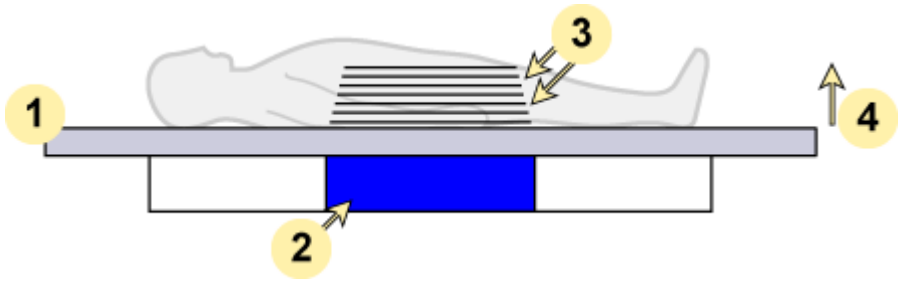
You are able to control slice settings through re-processing or technique preferences. Refer to *Image Viewer* (p. A-20) and *Reconstruction Preferences* (p. A-29) for more information.

Figure A-3 Illustration of slice reconstruction for a table exam



1. Table
2. Detector
3. Reconstructed slices
4. Height (distance from table or detector cover)

Standard linear tomography allows visualization of a plane within the body by simultaneous movement of the x-ray tube and the film, thereby blurring out structures above and below the selected plane. VolumeRAD takes multiple exposures during a single tomographic sweep with a fixed receptor, and reconstructs the data in order to visualize multiple planes from the surface of the receptor up through the imaged anatomy.

In a single energy acquisition, all the anatomical structures are crisp and visible, but the image is flat; there is no sense of depth. In a VolumeRAD slice, only structures within the viewed slice are crisp, while adjacent but out-of-slice structures are blurred. By viewing multiple slices in sequence, one can determine the depth and shape of a structure.

For example, a single energy acquisition will show that there is a foreign object in the chest cavity on the right or left side. A series of VolumeRAD slices will show if the object is inside the lung or just below the surface of the skin, if the object is closer to the posterior or anterior of the chest, and if it is shaped more like a disk or more like a sphere.

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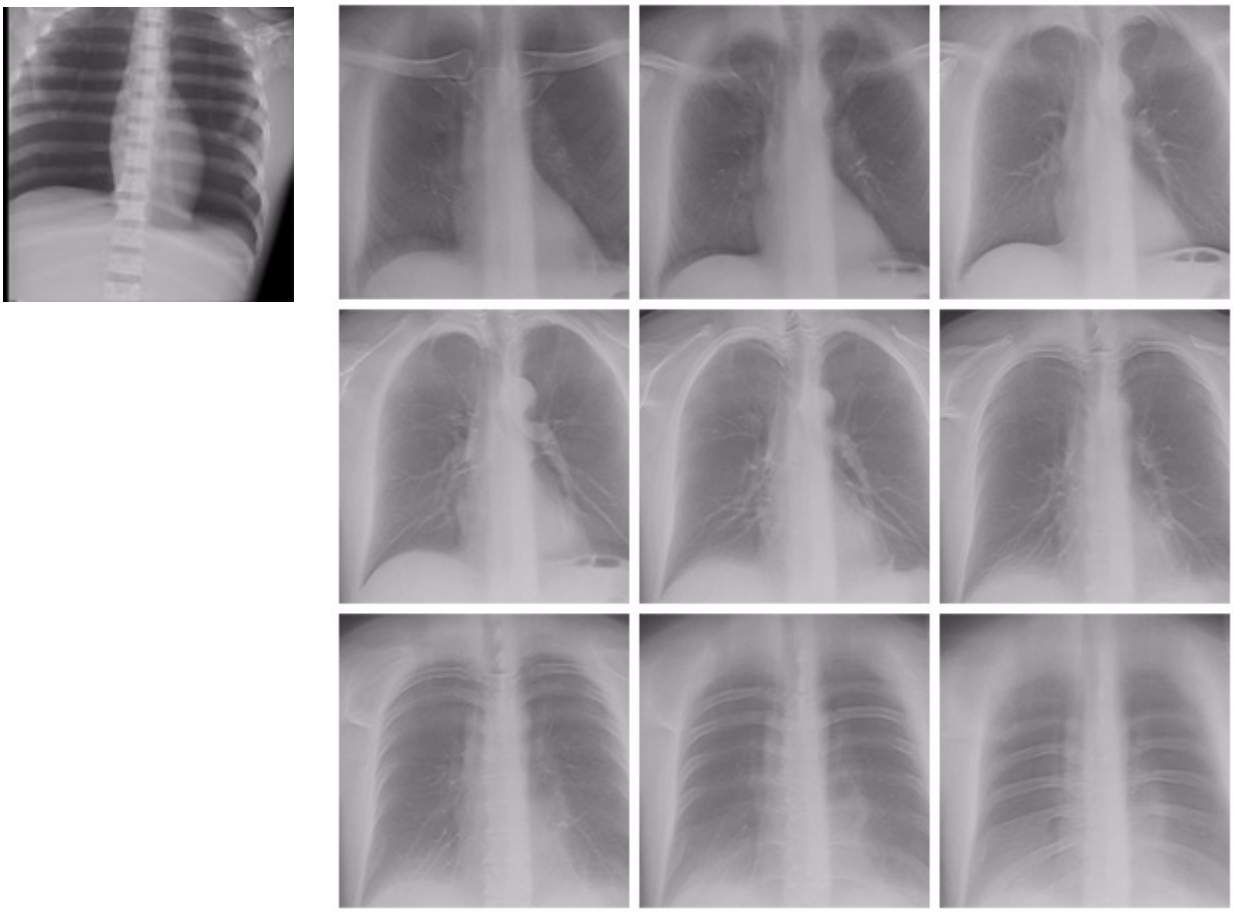
Figure A-4 Example of VolumeRAD reconstruction

Single acquisition (Scout) Multiple reconstructed slices



Configurations

VolumeRAD is a purchasable option that is available at both the table and the wall stand.

NOTE: The figures are used for illustration only. They don't necessarily represent the actual size.

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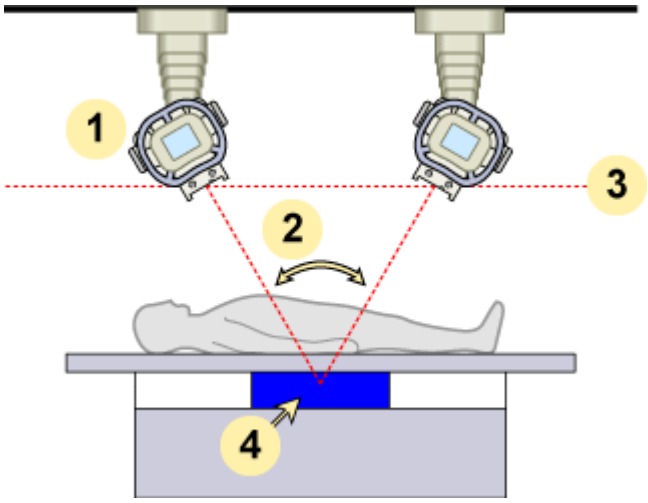
Table

In a table configuration, the OTS moves in the longitudinal direction while the x-ray tube angulates to point to the table detector.

Figure A-5 Table configuration

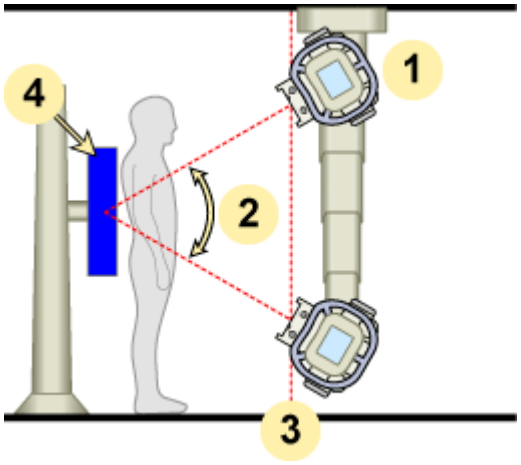


1. X-ray tube
2. Sweep angle
3. X-ray source plane
4. Table detector

Wall stand

For standard wall stands, the OTS moves vertically while the x-ray tube angulates to point to the detector.

Figure A-6 Wall stand configuration – vertical



1. X-ray tube
2. Sweep angle
3. X-ray source plane
4. Wall stand detector

Extended arm wall stands may be used with the detector in a horizontal position with the patient supported on a mobile table or stretcher (Figure A-7). The OTS moves in the longitudinal direction while the x-ray tube angulates to point to the detector.

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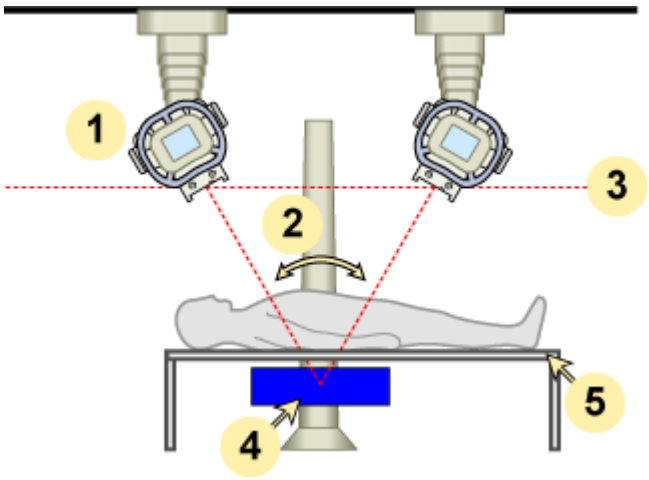
Figure A-7 Extended arm wall stand configuration - horizontal



1. X-ray tube
2. Sweep angle
3. X-ray source plane
4. Wall stand detector (in horizontal position)
5. Mobile table or stretcher

Safety Warnings

All other caution, warning, and danger statements in this manual still apply to VolumeRAD, with the addition of the following:

WARNING: Make sure that there are no people or objects in the tube's path during the sweep. Collision may result in injury or irreparable damage.

WARNING: Keep patient and any others in room clear of the OTS as it moves into position. The area 180cm in front of the wall stand should be kept clear during Auto Positioning.

Equipment

Room Layout

VolumeRAD requires that the equipment in the room be placed so that 1) the tube does not collide with anything as it travels through the sweep, and 2) so that the tube can be placed at the correct SID for the table and wall stand receptors.

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OTS User Interface

OTS control screen for VolumeRAD Scout (Figure A-8) is very similar to a standard exam screen.

The function is the same as for a single energy exposure:

- VolumeRAD x-ray techniques kV and mAs; these settings are synchronized with the acquisition workstation. Press the [+] and [-] buttons to adjust the kV or mAs.
- The screen displays actual SID, Tube Angle, and Column Rotation.
- The Image Size can be selected.

Refer to *Chapter 3: Hardware Overview-OTS Control Screen* (p. 3-14) for more information.

Figure A-8 OTS UI screen for VolumeRAD (horizontal and vertical presentation)

Upon completion of the Scout acquisition, the OTS control screen switches to the VolumeRAD sweep mode (Figure A-9).

Figure A-9 OTS UI screen after Scout acquisition (sweep mode)

Only the selected receptor icon is displayed on OTS control screen.

The screen has a "Retake Scout" button (Figure A-10) that has the same function as the one on the Acquisition screen.

Figure A-10 Retake Scout button on OTS

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Image Acquisition

The following sections describe how to take acquisitions and view them.

A VolumeRAD acquisition consists of two main parts:

- Scout – a standard, single energy acquisition used to determine the exposure settings and patient positioning. Once the exposure is made, you confirm that the settings are correct. Multiple Scouts may be taken to ensure that the sweep acquisition is correct.
- Sweep – the system takes multiple, low-dose exposures as the tube travels through the arc. The system then creates the "slices" to visualize the anatomy at various depths. Additional sweeps should only be made if the patient moved during the sweep and the slices are not of acceptable quality.

This section is an overview of the entire acquisition process from selecting the patient on the Worklist through completing the sweep on the acquisition screen.

Protocol Selection

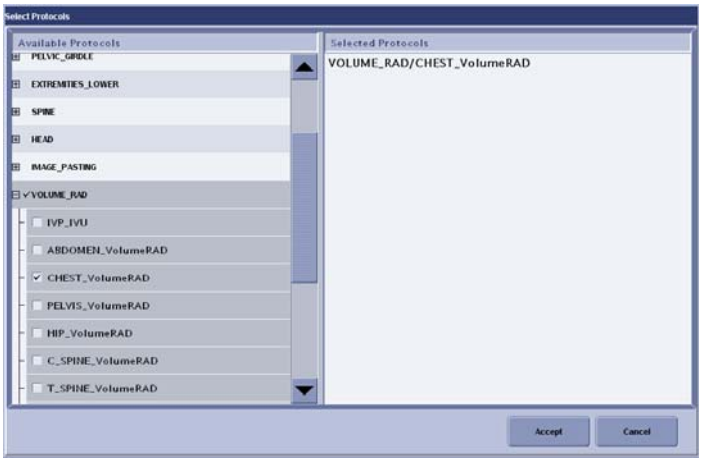
After you select the patient procedure from the Worklist, the Select Protocols screen [Figure A-11) appears.

Select the anatomy and exam(s) to perform. *Chapter 6: Image Acquisition-Select or Change Protocols* (p. 6-12) for more information.

Automatic Protocol Recognition (APR)—if enabled—functions the same as for other exams.

NOTE: The default is to have all the VolumeRAD protocols placed in a separate category; however, your protocol database may have been configured to place the VolumeRAD protocols into anatomical categories (e.g., the VolumeRAD/Chest exam may be placed in the Chest category.)

Figure A-11 Select Protocols screen



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Acquisition Chart

Table A-1 shows the default reconstruction properties.

Table A-1 Acquisition chart - default reconstruction properties

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Abdomen	antero-posterior	Small Adult	20	180	5	1	33	5	20	25
		Medium Adult	20	200	5	1	37	5	20	25
		Large Adult	20	250	5	1	47	5	20	25
		Small Pediatric	10	70	5	1	13	5	20	25
		Medium Pediatric	10	80	5	1	15	5	20	25
		Large Pediatric	10	100	5	1	19	5	20	25
Abdomen	IVP-IVU	Small Adult	60	120	10	1	7	5	20	25
		Medium Adult	70	150	10	1	9	5	20	25
		Large Adult	80	160	10	1	9	5	20	25
		Small Pediatric	20	40	5	1	5	5	20	25
		Medium Pediatric	20	60	5	1	9	5	20	25
		Large Pediatric	20	80	10	1	7	5	20	25
Ankle-joint	antero-posterior	Small Adult	10	90	4	1	21	5	40	30
		Medium Adult	10	100	4	1	24	5	40	30
		Large Adult	10	120	4	1	29	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Ankle-joint	lateral	Small Adult	10	90	4	1	21	5	40	30
		Medium Adult	10	100	4	1	24	5	40	30
		Large Adult	10	120	4	1	29	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Cervical-spine	antero-posterior	Small Adult	10	180	5	1	35	10	40	60
		Medium Adult	15	200	5	1	38	10	40	60
		Large Adult	20	220	5	1	41	10	40	60
		Small Pediatric	5	80	5	1	16	10	40	60
		Medium Pediatric	5	90	5	1	18	10	40	60
		Large Pediatric	5	100	5	1	20	10	40	60

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Table A-1 Acquisition chart - default reconstruction properties

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Cervical-spine	left lateral	Small Adult	80	140	5	1	13	12	30	60
		Medium Adult	80	170	5	1	19	12	30	60
		Large Adult	80	220	5	1	29	12	30	60
		Small Pediatric	40	90	5	1	11	12	30	60
		Medium Pediatric	40	120	5	1	17	12	30	60
		Large Pediatric	40	130	5	1	19	12	30	60
Chest	antero-posterior	Small Adult	20	220	5	1	41	10	30	60
		Medium Adult	20	280	5	1	53	10	30	60
		Large Adult	20	320	5	1	61	10	30	60
		Small Pediatric	20	100	5	1	17	10	30	60
		Medium Pediatric	20	140	5	1	25	10	30	60
		Large Pediatric	20	180	5	1	33	10	30	60
Chest	postero-anterior	Small Adult	20	220	5	1	41	10	30	60
		Medium Adult	20	280	5	1	53	10	30	60
		Large Adult	20	320	5	1	61	10	30	60
		Small Pediatric	20	100	5	1	17	10	30	60
		Medium Pediatric	20	140	5	1	25	10	30	60
		Large Pediatric	20	180	5	1	33	10	30	60
Facial-bones	lateral	Small Adult	5	100	4	1	25	10	40	60
		Medium Adult	5	120	4	1	30	10	40	60
		Large Adult	5	150	4	1	37	10	40	60
		Small Pediatric	5	60	4	1	15	10	40	60
		Medium Pediatric	5	70	4	1	17	10	40	60
		Large Pediatric	5	80	4	1	20	10	40	60
Facial-bones	postero-anterior	Small Adult	20	100	4	1	21	10	40	60
		Medium Adult	20	130	4	1	29	10	40	60
		Large Adult	20	170	4	1	39	10	40	60
		Small Pediatric	5	80	4	1	20	10	40	60
		Medium Pediatric	10	90	4	1	21	10	40	60
		Large Pediatric	10	100	4	1	24	10	40	60

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Table A-1 Acquisition chart - default reconstruction properties

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Foot	lateral	Small Adult	10	90	2	1	41	5	40	30
		Medium Adult	10	100	2	1	46	5	40	30
		Large Adult	10	120	2	1	56	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Foot	oblique	Small Adult	10	100	2	1	46	5	40	30
		Medium Adult	10	120	2	1	56	5	40	30
		Large Adult	10	130	2	1	61	5	40	30
		Small Pediatric	10	40	2	1	16	5	40	30
		Medium Pediatric	10	50	2	1	21	5	40	30
		Large Pediatric	10	60	2	1	26	5	40	30
Hand	lateral	Small Adult	5	70	2	1	34	5	40	30
		Medium Adult	5	80	2	1	39	5	40	30
		Large Adult	5	100	2	1	49	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Hand	postero-anterior	Small Adult	5	50	2	1	24	5	40	30
		Medium Adult	5	60	2	1	29	5	40	30
		Large Adult	5	70	2	1	34	5	40	30
		Small Pediatric	2	20	2	1	10	5	40	30
		Medium Pediatric	2	30	2	1	15	5	40	30
		Large Pediatric	2	40	2	1	20	5	40	30
Hip-joint	antero-posterior	Small Adult	20	160	5	1	29	10	40	60
		Medium Adult	20	170	5	1	31	10	40	60
		Large Adult	20	190	5	1	35	10	40	60
		Small Pediatric	10	100	5	1	19	10	40	60
		Medium Pediatric	10	120	5	1	23	10	40	60
		Large Pediatric	10	140	5	1	27	10	40	60

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Table A-1 Acquisition chart - default reconstruction properties

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Hip-joint	lateral	Small Adult	20	160	5	1	29	10	40	60
		Medium Adult	20	170	5	1	31	10	40	60
		Large Adult	20	190	5	1	35	10	40	60
		Small Pediatric	10	100	5	1	19	10	40	60
		Medium Pediatric	10	120	5	1	23	10	40	60
		Large Pediatric	10	140	5	1	27	10	40	60
Knee	antero-posterior	Small Adult	10	120	2	1	56	5	40	40
		Medium Adult	10	140	2	1	66	5	40	40
		Large Adult	10	160	2	1	76	5	40	40
		Small Pediatric	5	80	2	1	39	5	40	40
		Medium Pediatric	5	90	2	1	44	5	40	40
		Large Pediatric	5	100	2	1	49	5	40	40
Knee	lateral	Small Adult	10	120	2	1	56	5	40	40
		Medium Adult	10	140	2	1	66	5	40	40
		Large Adult	10	160	2	1	76	5	40	40
		Small Pediatric	5	80	2	1	39	5	40	40
		Medium Pediatric	5	90	2	1	44	5	40	40
		Large Pediatric	5	100	2	1	49	5	40	40
Lumbar-spine	antero-posterior	Small Adult	10	100	4	1	24	10	40	60
		Medium Adult	10	120	4	1	29	10	40	60
		Large Adult	10	140	4	1	34	10	40	60
		Small Pediatric	5	60	4	1	15	10	40	60
		Medium Pediatric	5	70	4	1	17	10	40	60
		Large Pediatric	5	80	4	1	20	10	40	60
Lumbar-spine	left lateral	Small Adult	80	140	4	1	16	12	30	60
		Medium Adult	80	170	4	1	24	12	30	60
		Large Adult	80	220	4	1	36	12	30	60
		Small Pediatric	40	90	4	1	14	12	30	60
		Medium Pediatric	40	120	4	1	21	12	30	60
		Large Pediatric	40	130	4	1	24	12	30	60

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Table A-1 Acquisition chart - default reconstruction properties

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Paranasal-sinus	lateral	Small Adult	5	100	2	1	49	10	40	60
		Medium Adult	5	120	2	1	59	10	40	60
		Large Adult	5	150	2	1	74	10	40	60
		Small Pediatric	5	60	2	1	29	10	40	60
		Medium Pediatric	5	70	2	1	34	10	40	60
		Large Pediatric	5	80	2	1	39	10	40	60
Paranasal-sinus	postero-anterior	Small Adult	20	100	2	1	41	10	40	60
		Medium Adult	20	130	2	1	56	10	40	60
		Large Adult	20	170	2	1	76	10	40	60
		Small Pediatric	5	80	2	1	39	10	40	60
		Medium Pediatric	10	90	2	1	41	10	40	60
		Large Pediatric	10	100	2	1	46	10	40	60
Pelvis	antero-posterior	Small Adult	20	180	5	1	33	10	40	60
		Medium Adult	20	200	5	1	37	10	40	60
		Large Adult	20	250	5	1	47	10	40	60
		Small Pediatric	10	70	5	1	13	10	40	60
		Medium Pediatric	10	80	5	1	15	10	40	60
		Large Pediatric	10	100	5	1	19	10	40	60
Shoulder	antero-posterior	Small Adult	5	150	5	1	30	5	40	60
		Medium Adult	5	200	5	1	40	5	40	60
		Large Adult	5	220	5	1	44	5	40	60
		Small Pediatric	5	100	5	1	20	5	40	60
		Medium Pediatric	5	120	5	1	24	5	40	60
		Large Pediatric	5	140	5	1	28	5	40	60
Temporo-mandibular-joint	lateral	Small Adult	5	100	2	1	49	10	40	60
		Medium Adult	5	120	2	1	59	10	40	60
		Large Adult	5	150	2	1	74	10	40	60
		Small Pediatric	5	60	2	1	29	10	40	60
		Medium Pediatric	5	70	2	1	34	10	40	60
		Large Pediatric	5	80	2	1	39	10	40	60

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Table A-1 Acquisition chart - default reconstruction properties

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Thoracic-spine	antero-posterior	Small Adult	10	100	4	1	24	10	40	60
		Medium Adult	10	120	4	1	29	10	40	60
		Large Adult	10	140	4	1	34	10	40	60
		Small Pediatric	5	70	4	1	17	10	40	60
		Medium Pediatric	5	80	4	1	20	10	40	60
		Large Pediatric	5	90	4	1	22	10	40	60
Thoracic-spine	left lateral	Small Adult	80	140	4	1	16	12	30	60
		Medium Adult	80	170	4	1	24	12	30	60
		Large Adult	80	220	4	1	36	12	30	60
		Small Pediatric	40	90	4	1	14	12	30	60
		Medium Pediatric	40	120	4	1	21	12	30	60
		Large Pediatric	40	130	4	1	24	12	30	60
Wrist	lateral	Small Adult	5	70	2	1	34	5	40	30
		Medium Adult	5	80	2	1	39	5	40	30
		Large Adult	5	100	2	1	49	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Wrist	postero-anterior	Small Adult	5	50	2	1	24	5	40	30
		Medium Adult	5	60	2	1	29	5	40	30
		Large Adult	5	70	2	1	34	5	40	30
		Small Pediatric	2	20	2	1	10	5	40	30
		Medium Pediatric	2	30	2	1	15	5	40	30
		Large Pediatric	2	40	2	1	20	5	40	30

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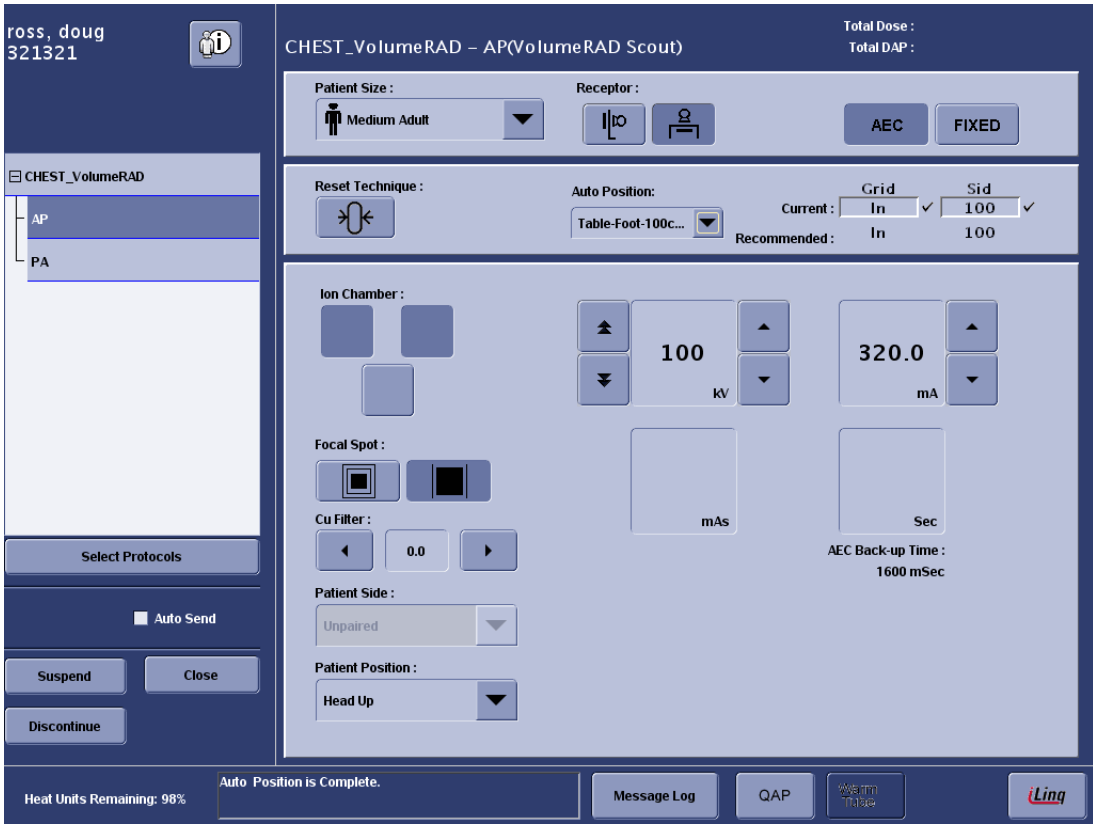
Scout Acquisition

You need to perform a Scout image acquisition before the VolumeRAD acquisition begins. Images from Scout are called VolumeRAD Scout images, which are no different from single energy images. The purpose of VolumeRAD Scout acquisition are:

- To confirm that the patient is correctly positioned.
- To get the VolumeRAD acquisition technique setting guideline.

The screen to acquire the VolumeRAD Scout (Figure A-12) is the same as the screen used for any other single energy acquisition.

Figure A-12 VolumeRAD Scout screen (before acquisition)



1. Select the view.
2. Select the patient size.
3. Select the receptor.
   - Based on the protocol configuration, you may be able to select Table or Wall stand receptors.

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4. Select the mode (AEC or Fixed).

NOTE: When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.

NOTE: The Scout may be either in FIXED or AEC mode, but the VolumeRAD sweep will always be a FIXED mode exposure with the technique controlled by the system.

5. Confirm or adjust the Grid and SID status.
6. Make technique adjustments as necessary: kV, mA, Focal spot, Cu Filter, and Ion chambers (AEC mode only).

NOTE: FOV cannot be less than 10x10cm.

NOTE: Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

7. Confirm the patient's position.
8. Take the Scout acquisition – prep and expose the same way as for a standard exam.
   - The Scout image appears on Image Viewer screen (right monitor) and is saved to the database.
9. Confirm the Scout:
   - Desired anatomy is imaged
   - Exposure is correct
   - Image is of acceptable quality
10. If the Scout is not acceptable:
    a) Click the [RETAKE Scout] button on either the Acquisition screen or OTS control screen (Figure A-13).
    b) Make adjustments to the patient position and settings as necessary.
    c) Prep and expose to acquire a new Scout image.

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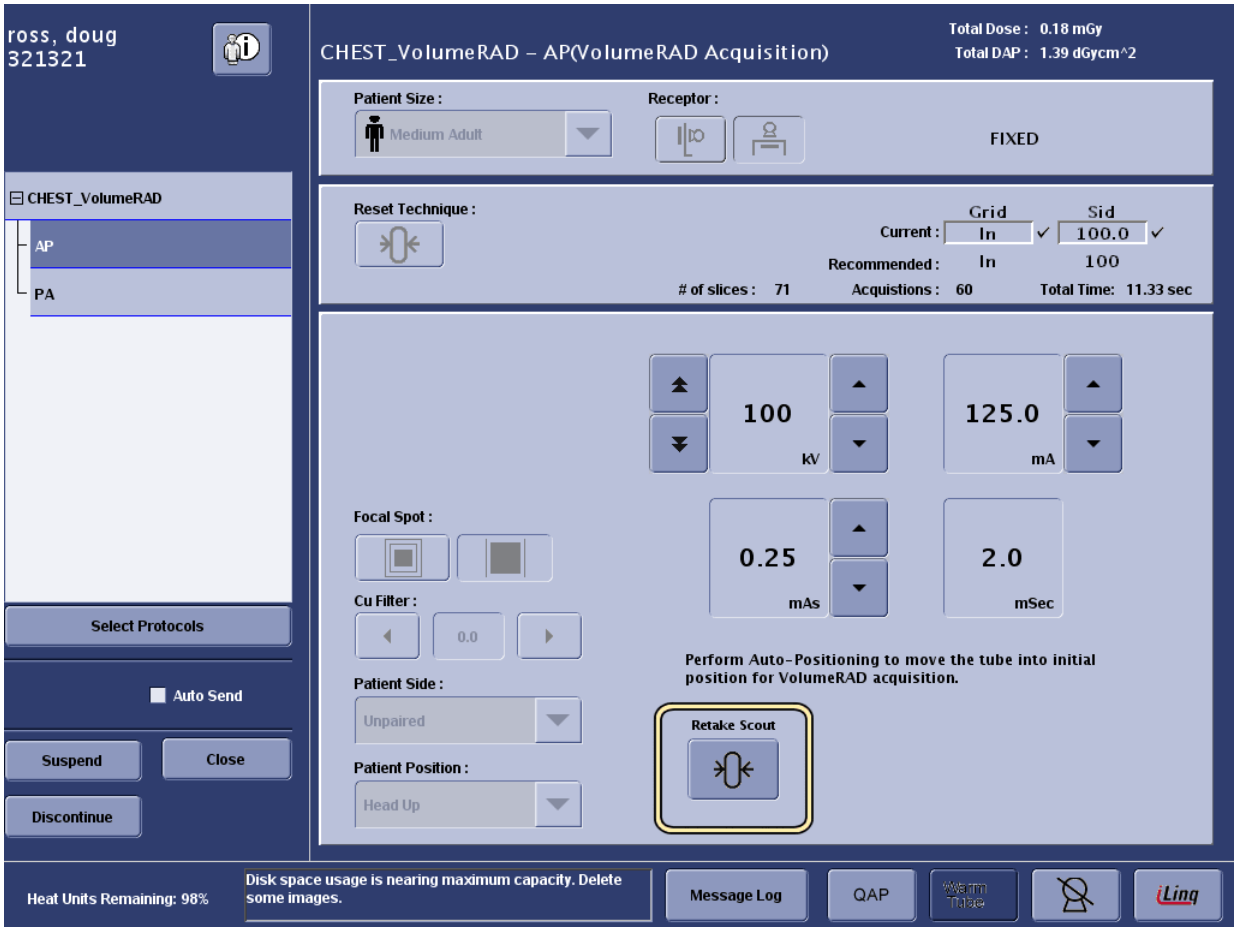
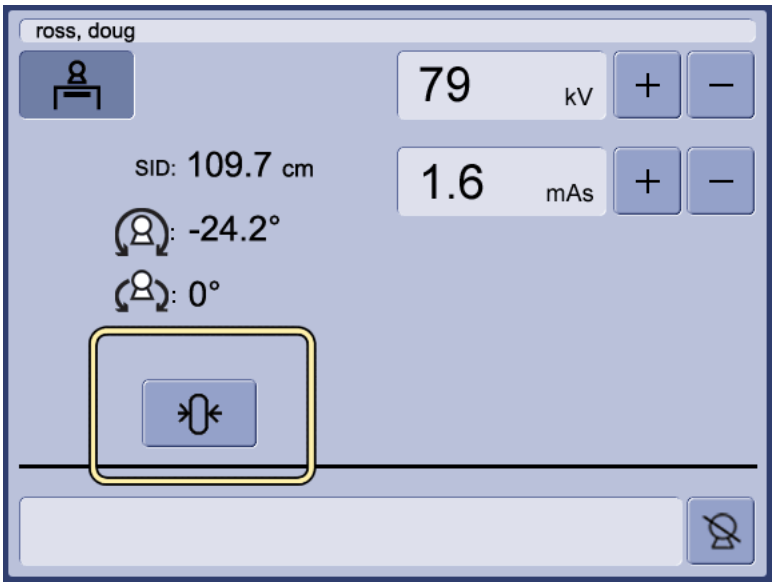
Figure A-13 Retake Scout buttons (after Scout acquisition)





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VolumeRAD Sweep Acquisition

Once the Scout acquisition is complete, the system console switches to the VolumeRAD acquisition screen (Figure A-14).

The number of slices, number of exposures, and total acquisition time are displayed.

The following information is retained from the Scout acquisition, but cannot be changed:

- Patient Size
- Receptor
- Cu Filter
- Focal Spot
- Patient Side
- Patient Position

NOTE: If you adjust the table height after the Scout, the OTS will track the table height change and maintain the SID. X-ray acquisition will be inhibited during the vertical tracking.

1. Press and hold the AUTO POSITIONING and POWER buttons on the RCIM until the tube has moved into position. (Do this step even if the system does not have auto positioning enabled.)

NOTE: Exposures will be inhibited until the tube has been re-positioned for the sweep.

- The system will beep when the tube has reached position.

2. Have patient suspend respiration, if required.
   - The Total Time (Figure A-14) shows the total time (in seconds) for the sweep to complete, therefore it is the length of time the patient must remain still. No VolumeRAD acquisition sweep will be longer than 12 seconds.

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Figure A-14 VolumeRAD Acquisition sweep screen

3. Prep and expose.
4. Hold the expose button down until the sweep has finished and the acquisitions have been made – wait until the system stops beeping.
   - Raw images begin to appear on the viewer.
   - Processed reconstructed slices will appear. Depending on how many processed images there are, it may take up to a few minutes for all the images to appear.

NOTE: There are a fixed number of Raw images and Reconstructed slices. The number of images depends on the anatomy being imaged. Refer to *Acquisition Chart* (p. A-9) for more information.

- Adjust the images and slice processing as described in Image Viewer section.

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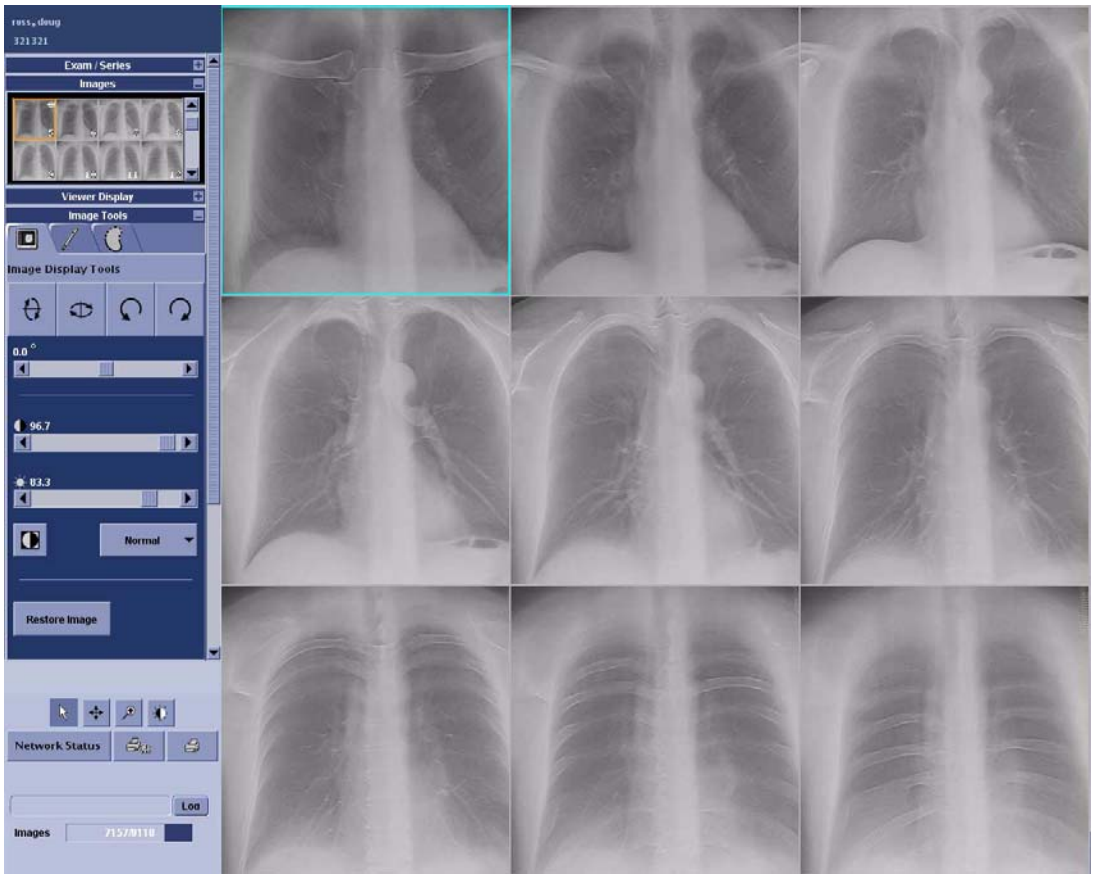
Image Viewer

For most functions, the Image Viewer controls for VolumeRAD are the same as for standard acquisitions. This section details the controls specific to VolumeRAD.

Refer to *Chapter 7: Image Viewer* for more information.

NOTE: The DEI indicator (if enabled) does not appear for reconstructed VolumeRAD slices. The manual shutter is also not available for VolumeRAD slices.

Figure A-15 Image Viewer screen for VolumeRAD showing multiple slices



Adjust Images

Any adjustments to made on one slice (contrast, brightness, rotation, etc.) are applied to all slices in the series. If there are multiple series, the adjustment will only be applied to slices within the same series as the selected image.

NOTE: Brightness/Contrast adjusted through the mouse control button may not be shown on all the images of the series until another palette, tool, or image is selected.

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View Slices

The Image Viewer displays all acquisitions and reconstructed slices.

To view slices in sequence, use the Page Up and Page Down keys on the keyboard.

NOTE: Slices will always appear in order with the slice closest to the receptor first and progressing to the last slice, which is farthest from the receptor.

Reprocess Images (Adjust Slices)

In addition to the standard reprocessing functions described in *Chapter 7: Image Viewer-Re-process Images* (p. 7-18), the Image Processing tab on the Image Tools palette (Figure A-16) allows you to change the number of slices by adjusting the start height, end height, slice interval, and sampling factor.

Adjust the processing as described in Table A-2.

Figure A-16 VolumeRAD Image Tools palette – Image Processing tab

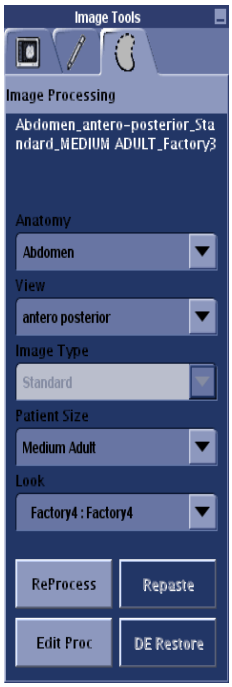

Table A-2 VolumeRAD Image Tools palette features

Function	Description
Current processing Chest_antero-posterior_VolumeRAD_MEDIUM ADULT_Factory1	Shows the current image processing settings.

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Function	Description
Start Height (mm) 	Selects the distance from the table top or detector cover at which the first slice is reconstructed.
End Height (mm) 	Selects the distance from the table top or detector cover at which the last slice is reconstructed.
Slice Interval (mm) 	Selects the distance between slices. The range is 1-50mm.
Sampling Factor 	Selects the amount of data used for each slice. As in conventional tomography, the slice thickness (n) is determined by the sweep angle. The VolumeRAD sampling factor is 1. VolumeRAD allows the user to include additional data on either side of the nominal slice (n) for inclusion for the reconstructed slice. A number of "virtual" slices are created for every actual slice. The system then averages the information from the virtual slices above and below into the actual slice. Sampling Factor selects the number of virtual slices used to create the actual slice. The Sampling Factor is always an odd number. The maximum selectable range is determined by the Start and End Heights and Slice Interval. **NOTE:** Changing the Sampling Factor does not change the total number of slices.
# of slices 	Displays the calculated number of slices based on Start Height, End Height and Slice Interval. Adjust these factors to change the number of slices.
Anatomy	Displays the anatomical region.

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Function	Description
View	Displays the anatomy view. For example, antero-posterior.
Image Type	Displays the image type for this exam (i.e., VolumeRAD).
Patient size	Displays the patient size. For example, large adult, small pediatric, etc.
Look	Selects the processing look. Refer to *Chapter 12: Set Preferences-Image Processing* (p. 12-32) for more information.
[RECON] 	Applies retrospective reconstruction with the selected parameters and factory look. The retro recon slices will be in a new series. When in review mode, re-processing will create new images in the series.
[EDIT PROC]	Brings up a screen that allows you to view the Factory look settings or create custom looks. **NOTE:** Noise and Tissue Equalization (TE) adjustment is not available for VolumeRAD reprocessing. Refer to *Chapter 12: Set Preferences-Image Processing* (p. 12-32) for more information about building custom looks.

Annotate Slices

The Annotation tab of the Image Tools palette for VolumeRAD (Figure A-17) is similar to standard images with the addition of functions to apply or remove image annotations from all slices in a VolumeRAD series. Refer to *Annotate and Mask Images* (p. 7-9) for more information about the basic functions.

NOTE: The manual shutter (cropping) is not available for images in a VolumeRAD series.

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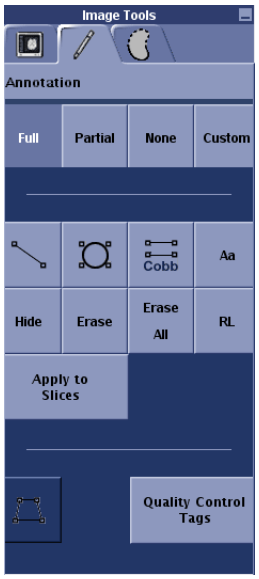
Figure A-17 VolumeRAD Image Tools palette- Annotation tab



Add Image Annotations

1. Select the image to annotate, if necessary.
2. Click the button of the annotation to insert.

NOTE: Selected image annotations are yellow with red handles. Unselected image annotations are aqua without handles.

3. Move, re-size, or change the angle of the annotation. Refer to *Chapter 7: Image Viewer-Add Image Annotations* (p. 7-13) for more information.
4. To apply the annotation to all slices in the series:
   a) Select the annotation.
   b) Click [APPLY TO SLICES] from the palette.
      – The annotation is applied to all images.

NOTE: The system will only apply one annotation at a time to all slices. If you have multiple annotations that you wish to apply, repeat steps 4a and 4b for each annotation.

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Delete Image Annotations

Follow this process to remove image annotations.

NOTE: It is not possible to recover deleted annotations.

1. Select the annotation.
2. Click [ERASE] or [ERASE ALL].
   - If [ERASE] was clicked, a message appears: "Would you like to erase this annotation for all images in the series or just this one image?"
   - If [ERASE ALL] was clicked, a message appears: "Would you like to erase all annotations from all images in this series or just this one image?"
3. Click [ALL] or [ONE].
   - [ALL] removes the annotation(s) from all images in the series.
   - [ONE] removes the annotation(s) from the current image only.

Apply Quality Control Tags

The quality check indicator marks images of acceptable quality that will be auto printed and auto pushed upon exam close. Refer to *Chapter 7: Image Viewer-Apply Quality Check Mark* (p. 7-24) for more information.

Quality control tags may be applied to all images in a VolumeRAD series or to specific slices.

NOTE: Quality Control Tags are only available during live exams.

Follow this process to apply quality control tags.

1. Select an image in the series.
2. Click [QUALITY CONTROL TAGS].
   - The Quality Control Tags dialog box (Figure A-18) appears.

Figure A-18 Quality Control Tags dialog box

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3. Select the slices to which the tag should be applied.
   - **All** applies the tag to all slices.
     - If your system has Auto Tag set to ON, all slices have the quality control tag already applied by default.
   - **Slices** allows you to type the number of the slice(s), a range of slices, or a combination of single slices and ranges.
     - If your system has Auto Tag set to ON, the tags will be **removed** from all images that are not within the entered Slices range. If the Slices range is left blank, tags will be removed from the entire series. Refer to *Chapter 12: Set Preferences-Image Management* (p. 12-17) for information about turning Auto Tag ON or OFF.
4. Click [APPLY].
   - [CANCEL] closes the dialog box without applying tags.

Print Slices

VolumeRAD slices are printed using the same methods as for standard exams. Refer to *Chapter 7: Image Viewer-Print Images* (p. 7-24) for more information.

Image Management

Systems that have VolumeRAD will have the capacity to store up to 8,930 images total (raw and processed). Typically, this means the system will retain approximately 4,000 image instances.

Image management functions for VolumeRAD exams are the same as for standard exams. Refer to *Chapter 8: Image Management* for more information.

Because of the number of images created during a VolumeRAD exam, use a recordable DVD disk (DVD-R) when archiving images or saving images to disk. Refer to *Chapter 8: Image Management-Copy Exams to a CD or DVD* (p. 8-11) for more information about the procedure.

NOTE: Exams cannot be saved to a re-writable disk (DVD-RW or CD-RW).

Preferences

Protocol Editor (Scout)

The protocol editor for VolumeRAD is essentially the same as for other protocols. This section describes the specific differences to edit or add VolumeRAD protocols.

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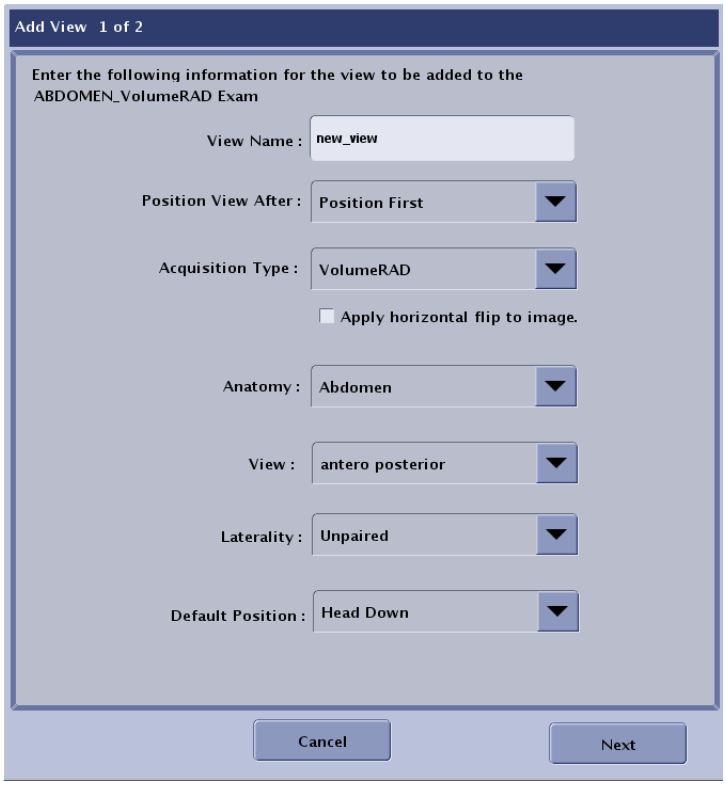
Refer to *Chapter 12: Set Preferences-Protocols* (p. 12-42) for more information about the basic protocol editing process.

When adding or editing a view for VolumeRAD, select the Acquisition Type of VolumeRAD (Figure 18)

Figure A-19 Set preferences – Add (or Edit) View 1 of 2



Pressing the "Next" button switches the screen to protocol default setup for VolumeRAD Scout. The Scout can be either AEC or Fixed acquisition mode.

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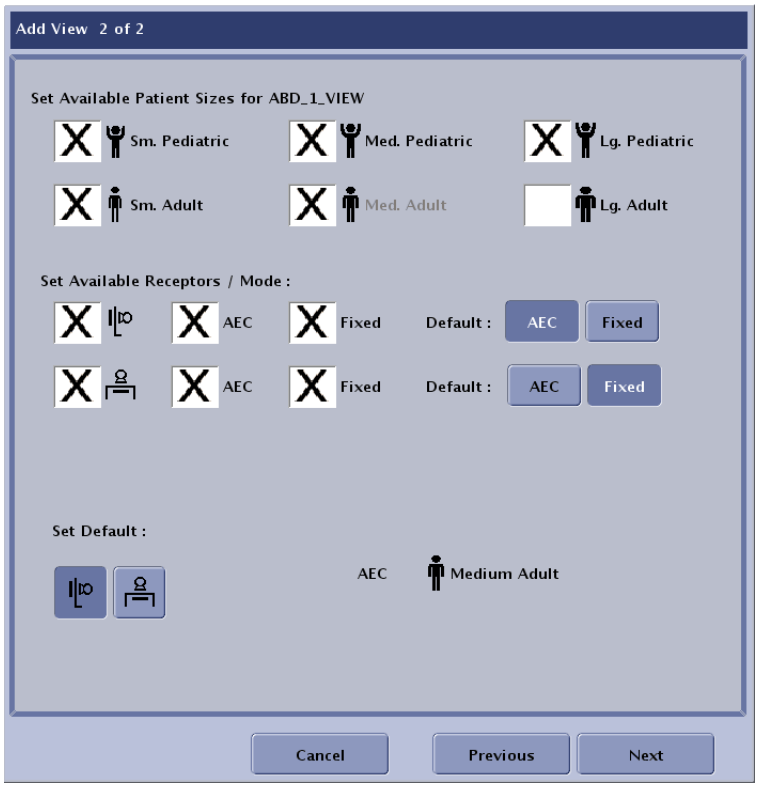
Figure A-20 Set preferences – Add (or Edit) View 2 of 2



Pressing “Next” button switches the screen to Techniques selection for VolumeRAD Scout. The technique screen UI for a VolumeRAD Scout acquisition is similar to a single energy acquisition.

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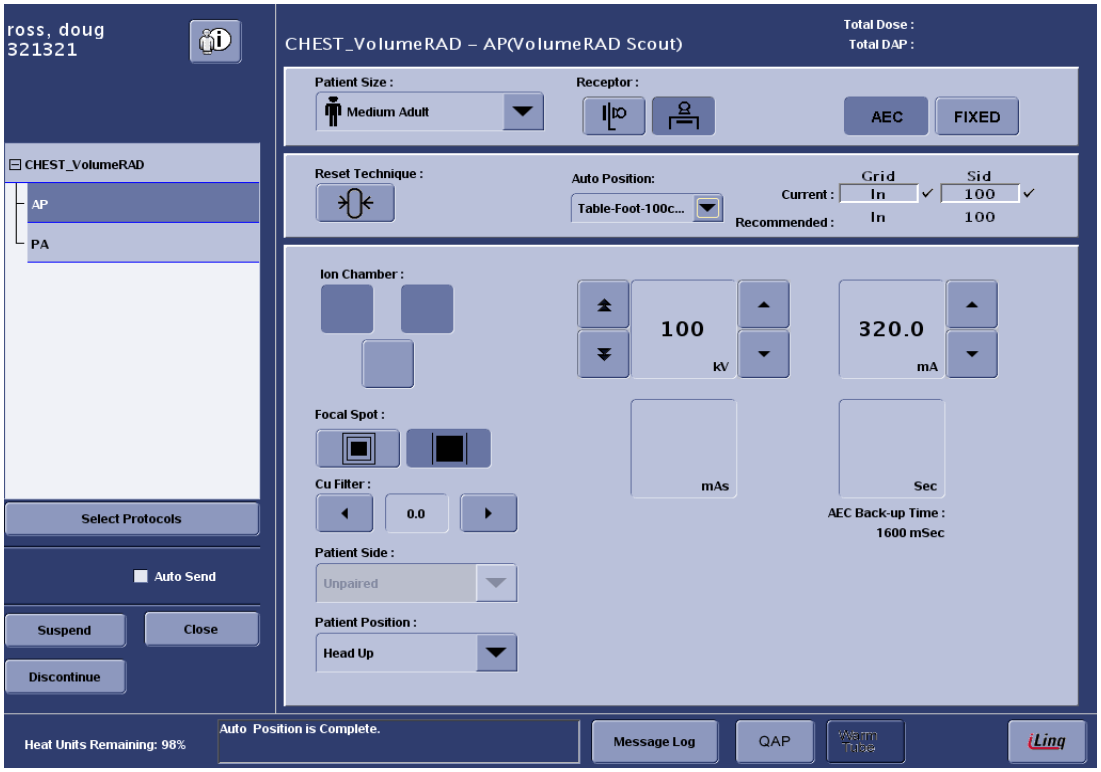
Figure A-21 Set preferences – Technique selection



1. Select the default Grid, Focal Spot, Cu Filter and Film Speed for Scout.
2. Select the SID.
   - For Wall stand, select SID of 100cm or 180cm.
   - For Table, the recommended SID is 100cm (display only).
3. Select the default kV, mA for Scout. If the Scout acquisition mode is Fixed, then mAs is also be adjustable.
4. If Scout is in AEC mode, select default Ion Chambers for AEC Scout.

Reconstruction Preferences

Reconstruction preferences define the slice parameters (start and end height, slice interval, etc.) used to create the slices for the protocol. Reconstruction preferences may also be applied to multiple protocols.

The Image Viewer screen contains tools to create reconstructions for an individual exam. Refer to *Reprocess Images (Adjust Slices)* (p. A-21) for more information.

Follow this process to change the reconstruction preferences.

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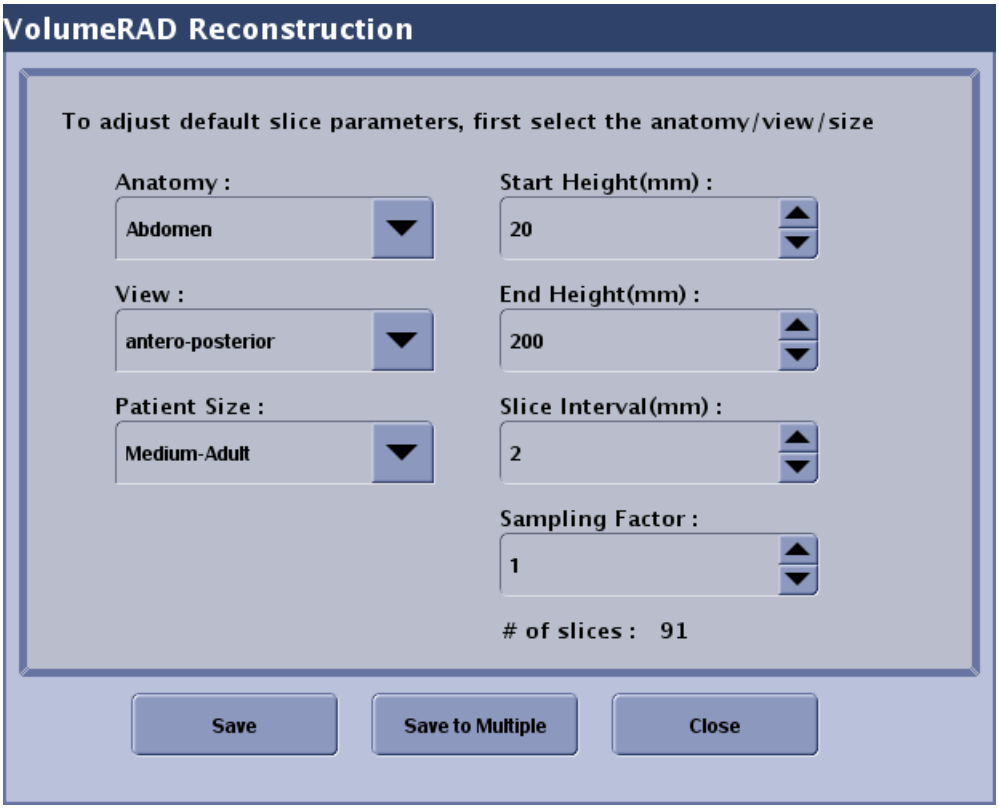
1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > VolumeRAD**.
3. Click VolumeRAD Reconstruction [EDIT].
   - The VolumeRAD Reconstruction screen (Figure A-22) appears.

Figure A-22 VolumeRAD Reconstruction



4. Select the **Anatomy**.
5. Select the **View**.
6. Select the **Patient Size**.
7. Adjust the parameters as described in Table A-3.

Table A-3 VolumeRAD reconstruction parameters

Function	Description
Start Height (mm)	Selects the distance from the table top or detector cover at which the first slice is reconstructed.

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Function	Description
End Height (mm)	Selects the distance from the table top or detector cover at which the last slice is reconstructed.
Slice Interval (mm)	Selects the distance between slices. The range is 1-50mm.
Sampling Factor	Selects the amount of data used for each slice. As in conventional tomography, the slice thickness (n) is determined by the sweep angle. The VolumeRAD sampling factor is 1. VolumeRAD allows the user to include additional data on either side of the nominal slice (n) for inclusion for the reconstructed slice. A number of "virtual" slices are created for every actual slice. The system then averages the information from the virtual slices above and below into the actual slice. Sampling Factor selects the number of virtual slices used to create the actual slice. The Sampling Factor is always an odd number. The maximum selectable range is determined by the Start and End Heights and Slice Interval. **NOTE:** Changing the Sampling Factor does not change the total number of slices.
# of slices	Displays the calculated number of slices based on Start Height, End Height and Slice Interval. Adjust these factors to change the number of slices.

8. When finished adjusting parameters, click [SAVE] or [SAVE TO MULTIPLE].
   - [SAVE] applies the parameters to the currently selected patient size.
     - A message appears: "Save changes?"
     - Click [YES].
   - [SAVE TO MULTIPLE] applies the parameters to multiple patient sizes within the selected anatomy (Figure A-23).
     - The Save to Multiple screen appears.
     - Select the **Patient Size** to save the new look to.
     - Click [SAVE].

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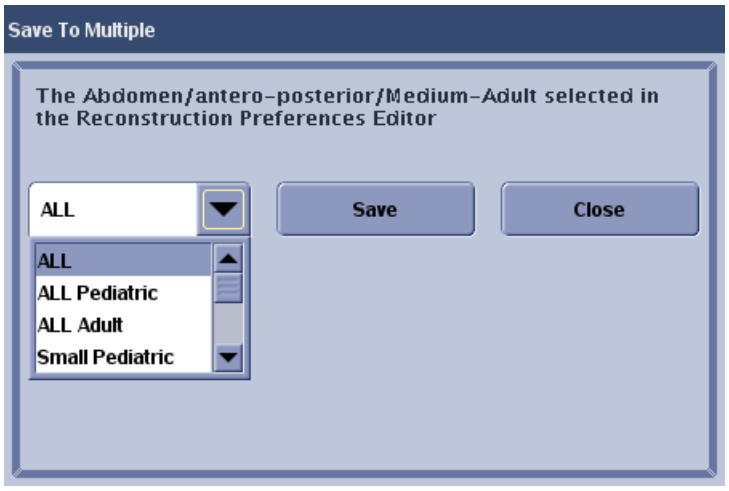
Figure A-23 VolumeRAD Reconstruction - save to multiple



Dose Preferences

Dose ratio is a multiplier that allows you to control the dose for the VolumeRAD sweep over the dose for the Scout. For example, a dose ratio of 3 means that the VolumeRAD sweep will be performed at 3 times the dose of the Scout for that exam.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > VolumeRAD**.
3. Click VolumeRAD Reconstruction [EDIT].
   - The VolumeRAD Reconstruction screen (Figure A-24) appears.
4. Select the **Anatomy**.
5. Select the **View**.
6. Select the **Patient Size**.
7. Select the **Dose Ratio**.

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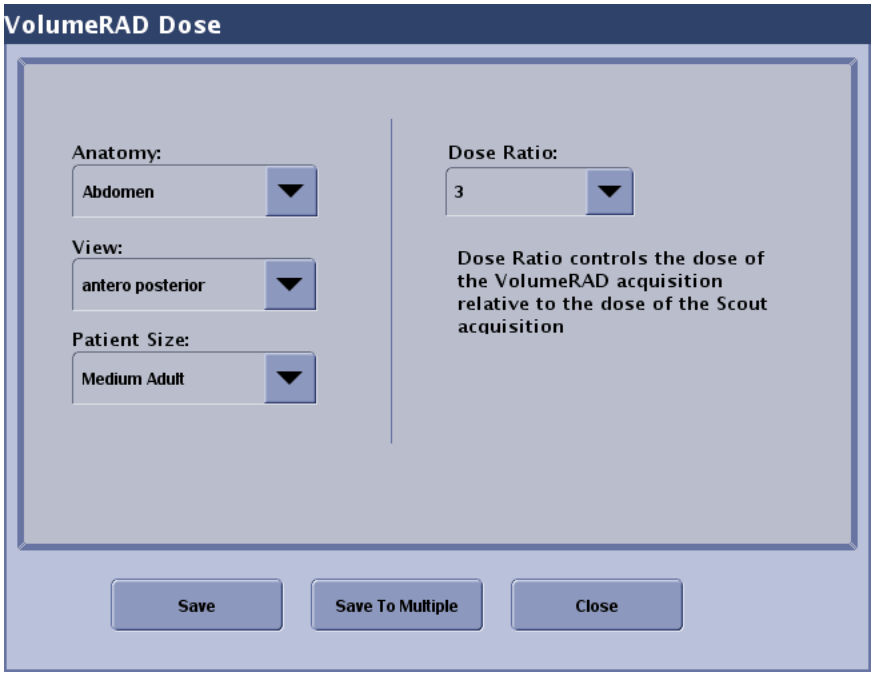
Figure A-24 VolumeRAD Dose



8. When finished, click [SAVE] or [SAVE TO MULTIPLE].
   - [SAVE] applies the ratio to the currently selected patient size.
     - A message appears: "Save changes?"
     - Click [YES].
   - [SAVE TO MULTIPLE] applies the ratio to multiple patient sizes within the selected anatomy.
     - The Save to Multiple screen appears (Figure A-25).
     - Select the **Patient Size** to save the new look to.
     - Click [SAVE].

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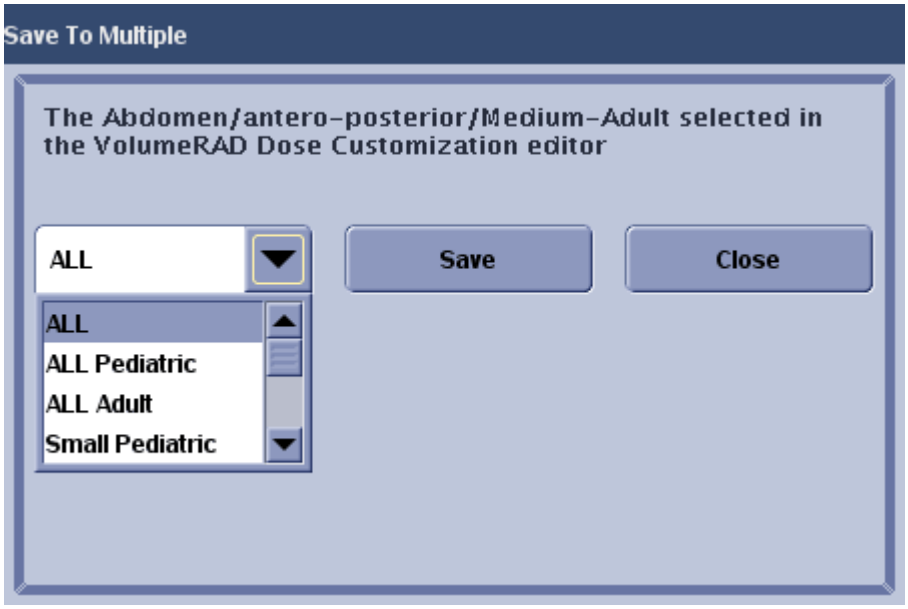
Figure A-25 Save Dose to multiple



Auto Printing Preferences

The following process describes how to configure auto printing for VolumeRAD only. Refer to *Chapter 12: Set Preferences-Auto Print* (p. 12-18) for more information about configuring general auto print functions.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
   - The Default Print/Auto Print screen appears.
4. Click VolumeRAD [EDIT].
   - The VolumeRAD Printing screen (Figure A-26) appears.
5. Complete the information as described in Table A-4.
6. When finished, click [SAVE] to retain your changes.
7. Click [CLOSE].

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Figure A-26 VolumeRAD auto printing preferences

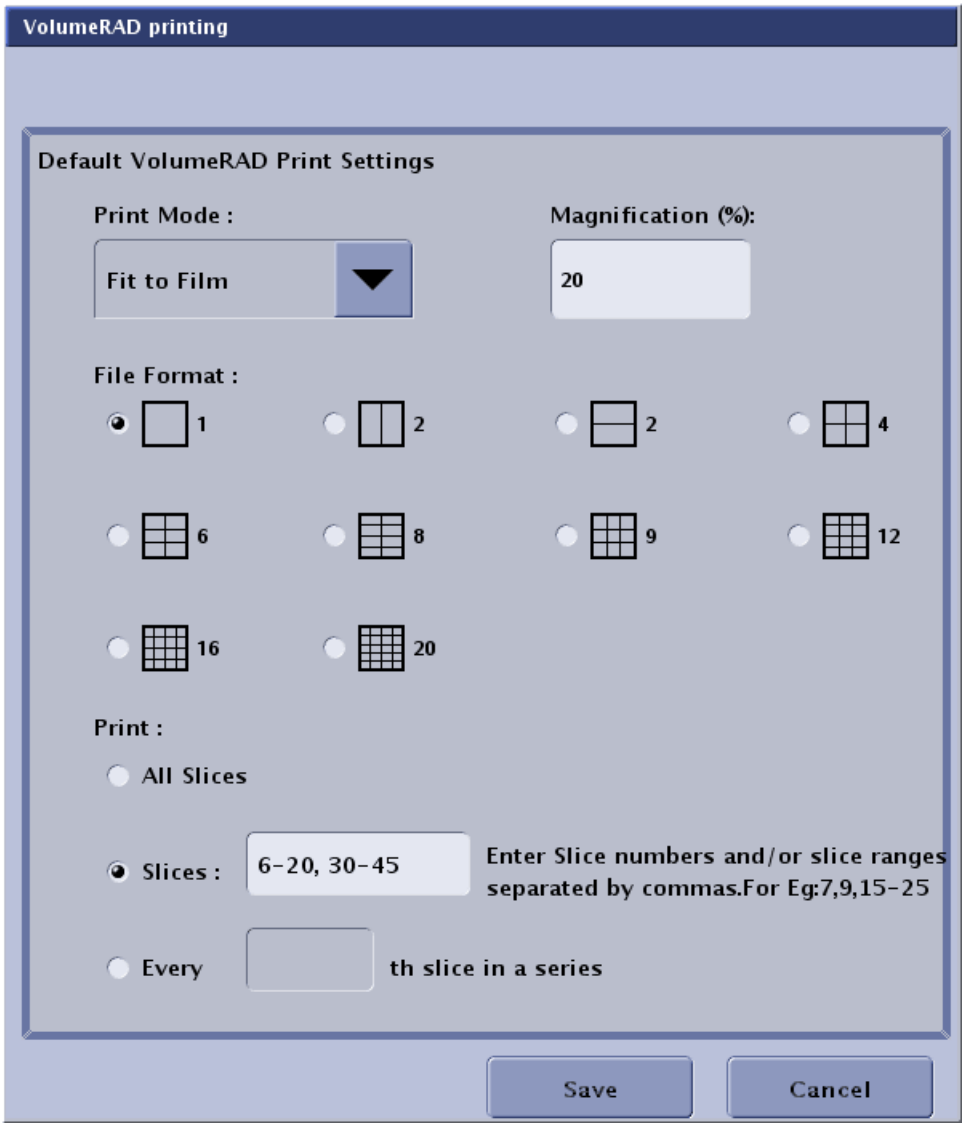

Table A-4 VolumeRAD Auto print functions

Function	Description
Print Mode	Provides options on the size of the image data printed. Available options are: • True Size • Fit to Film • Reduced Size

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Function	Description
Magnification	Allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%.
File Format	Selections allow the number of images that may be printed on a single sheet of film or paper. Some selections control the orientation of the images on the page: for example, 2 images per page may be side by side or one on top of the other.
Print	Selects which slices will be printed. Available options are: • All Slices – Prints all slices in a series. • Slices – Prints only the slices or ranges that are entered into the text box. • Every __the slice in a series – Prints only a select number of slices for the series. For example, entering "4" into the text box means that only every 4th slice will be printed.

Workflow

1. Select the patient from the Worklist (or add the patient).
2. Start or Resume the exam.
3. Select VolumeRAD protocol.
   - The Acquisition screen appears.
4. Align tube to receptor (if enabled, use auto positioning).
5. Position the patient to the receptor.
6. Select the appropriate FOV for the anatomy.

NOTE: FOV cannot be less than 10x10cm. Additional manual collimation is not possible with a small FOV.

7. Collimate and shield as appropriate for the exam.
8. Adjust the technique for the Acquisition screen as needed.
9. Take Scout acquisition.
10. Verify that the image is acceptable and that the patient is properly positioned.

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11. Perform Auto-positioning to move the tube into initial position for VolumeRAD acquisition.
12. Take VolumeRAD acquisition (sweep).
13. Review images on the Viewer screen.
    - If necessary, adjust or reprocess acquisition to adjust slices until desired reconstruction is obtained. Refer to *Reprocess Images (Adjust Slices)* (p. A-21) for more information.
14. Manually print selected slices if desired. Refer to *Print Slices* (p. A-26) for more information.
15. Close the exam to perform Auto Print/Auto Send.

NOTE: If the exam is closed and then re-opened in order for a physician to view images, the Scout must be repeated before any additional VolumeRAD sweeps can be performed. This is because the technique settings for the sweep are derived from the Scout.

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Appendix B
Login Administration

In the effort to provide aid for our customers in complying with the Health Insurance and Portability and Accountability Act (HIPAA), the Enterprise Access Authorization and Audit (EA3) control features have been implemented in this product. It is the facility's responsibility to ensure the proper usage of these features in order to conform to the Privacy Act.

Topics covered include:

- *Enabling EA3 Login* (p. B-2)
- *Understanding Local and Enterprise Environments* (p. B-2)
- *Understanding Privileges, Groups, and Users* (p. B-2)
- *Administering Groups and Users* (p. B-4)
  - *Accessing the Login Administration Screens* (p. B-4)
  - *Working with Groups* (p. B-5)
    - *Add Groups* (p. B-5)
    - *Assign Privileges to Groups* (p. B-6)
    - *Remove Groups* (p. B-6)
    - *Show Protected Groups* (p. B-6)
  - *Working with Users* (p. B-8)
    - *Add Users* (p. B-8)
    - *Assign Users to Groups* (p. B-9)
    - *Change User Password* (p. B-10)
    - *Remove Users* (p. B-10)
    - *Show Protected Users* (p. B-10)
- *Viewing the Audit Log* (p. B-12)
- *Administering System Configuration* (p. B-13)
  - *Change Display Settings and Enable Enterprise Authorization* (p. B-13)
  - *Configure Enterprise Authorization* (p. B-15)
  - *Configure Audit Log* (p. B-16)
  - *Use LDAP Console* (p. B-17)

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Enabling EA3 Login

On the Service User Interface, click on the Configuration Tab and select the Advanced Options. Click on the Radio Buttons available to Enable/ Disable the HIPAA option. By default the HIPAA option is disabled.

The Login feature can be turned on or off by your Field Engineer.

Understanding Local and Enterprise Environments

The login function may be administered at either a local or enterprise level.

Local (or stand-alone) login administration is for a piece of equipment or information system to have its own set of login names and passwords. Each local system needs to have users with admin access set up to administer the login function. From the user's perspective, he or she needs a login name and password for each piece of equipment and information system necessary to perform his or her job.

Enterprise login administration is to use the site's existing login names and passwords to allow access to multiple pieces of equipment and information systems throughout the site. The login function is administered centrally by the site's system administrator because each system sends and receives login information over the network. From the user's perspective, he or she only needs one login name and password to access all equipment and systems necessary to perform his or her job.

For mobile units in an enterprise environment, login information is sent and received only when the unit is connected to the network.

Understanding Privileges, Groups, and Users

Privileges are the rights to access a system or piece of equipment and perform certain functions. Privileges are assigned to groups. The privileges are created by GE and cannot be changed. They are:

- **GE Service** allows access to all functions for service and maintenance personnel.
- **Administrator** allows access to the Login administration and Preferences functions in addition to being able to add procedures to the Worklist, conduct exams, and manage images.
- **Standard and Limited User** only allows access to add procedures to the Worklist, conduct exams and manage images.

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Groups are categories of users that have certain privileges assigned. Users get their privileges from groups. A user may be assigned to several groups. Groups are created and assigned privileges by a user with GE Service or Administrator access. If you do not have an enterprise system, the assignment of group privileges will probably be limited to those who have administrator privileges and those who don't. If your system is set up for enterprise login, your IT person or administrator will be using more of the features.

When equipment is installed in an enterprise environment, the administrator configures the enterprise groups that the equipment will use. That is, the enterprise environment will have groups for many levels of access and job descriptions, the administrator will set the individual piece of equipment to use a sub-set of those groups.

Users are individuals who have permission to use a particular system. Users are created and assigned to groups by a user with GE Service or Administrator access. These administrators may be IT personnel in an enterprise environment, or a site manager or lead tech in stand-alone environments. The administrator adds new users and assigns the users to a group which dictates the level of privileges a person will have. For example, a person named Sue Smith could belong to a group called technologists, radiologists, administrators, or any combination.

When configuring a system (enterprise or local) always create the groups and assign group privileges first, then add individual users to the groups.

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Administering Groups and Users

This section describes how to perform the tasks relating to administering the login function.

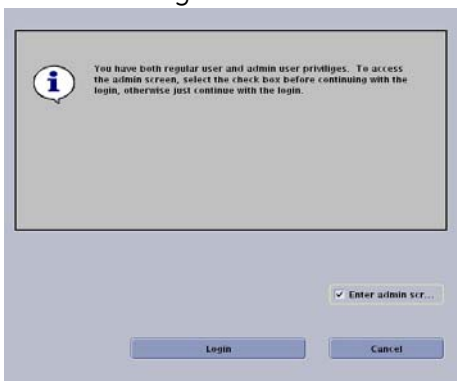
Accessing the Login Administration Screens

Follow this process to gain access to the login administration screens.

Follow this process to log on to the system.

1. Start up the system or log off the previous user.
   - The Login screen appears.
2. Type in your **Login Name**.
3. Type in your **Password**.
4. Click [LOGIN].
   - If you have administrator access, a message (Figure B-1) appears: "You have both regular user and admin user privileges. To access the admin screen, select the check box before continuing with the login, otherwise just continue with the login."
   - If the message does not appear, then you do not have access to the login administration functions.
5. Select the **Enter admin screen** checkbox.
6. Click [LOGIN].
   - The Login Administration screen appears.
   - [CANCEL] closes the message and returns you to the main Login screen.
7. Click [EXIT] on the bottom of any login administration screen to return to the standard login screen.

Figure B-1 Administrator access message


You have both regular user and admin user privileges. To access the admin screen, select the check box before continuing with the login, otherwise just continue with the login.
Enter admin scr...
Login
Cancel

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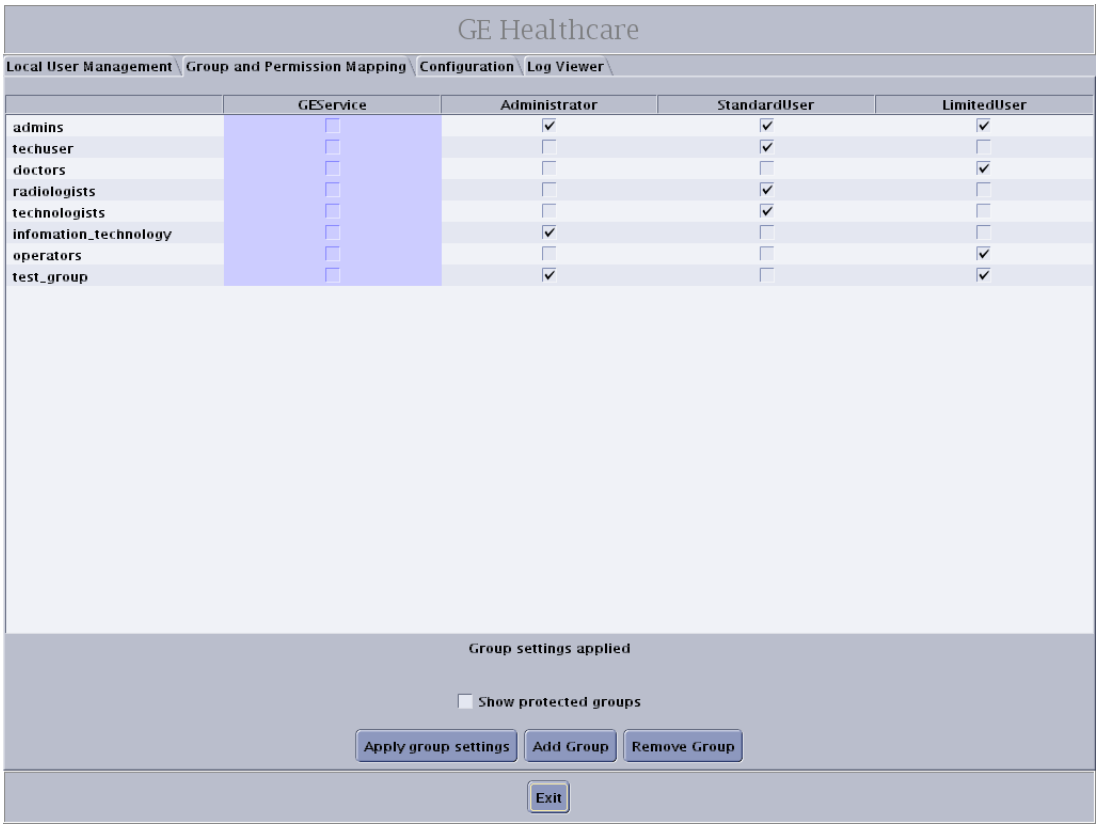
Working with Groups

The Group and Permissions Mapping tab (Figure B-2) allows you to add groups, remove groups, and assign privileges to groups. On this screen, the four privileges categories are at the top of the screen (columns) and the group names are at the left edge of the screen (rows).

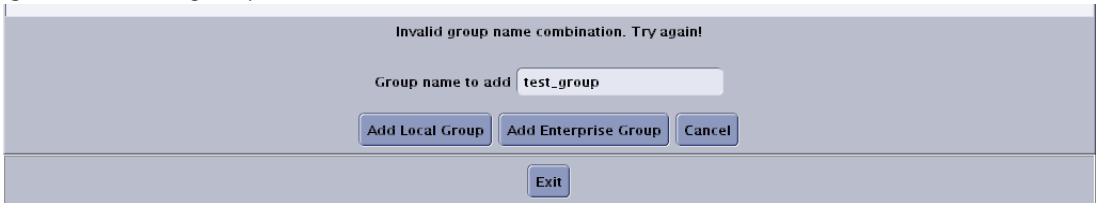
Figure B-2 Group and Permissions Mapping tab



Add Groups

1. Select the **Group and Permissions Mapping** tab, if necessary.
2. Click [ADD GROUP].
3. Type a name for the group in the text box that appears near the bottom of the screen (Figure B-3).

Figure B-3 Add group text box



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NOTE: Remember the following when creating group names:

- Group names cannot have spaces or uppercase (capital) letters. Use all lowercase letters in the group name and use underscores to separate words.
- The group name must be unique. That is, the system will not allow two groups to have the same name.

4. Click [ADD LOCAL GROUP] or [ADD ENTERPRISE GROUP] as appropriate.
   - The new group name is added to the table.
   - If the group name cannot be used you will receive a message that informs you of the problem. Type the correct information and click [SUBMIT] again.

Assign Privileges to Groups

1. Click a group name to select it.
2. Select the checkbox under the privilege heading. Refer to *Understanding Privileges, Groups, and Users* (p. B-2) for definitions of privileges.

NOTE: The Service privilege is protected and cannot be selected. Only GE Service personnel can assign a group to the Service privilege.

3. Click on a selected checkbox to remove the privilege.

NOTE: You may select or deselect privileges for multiple groups.

4. Click [APPLY GROUP SETTINGS].
   - A message appears: “Apply group settings.”
5. Click [APPLY NOW].

Remove Groups

1. Click a group name to select it.

NOTE: You are able to only delete one group at a time.

2. Click [REMOVE GROUP].
   - A message appears: “Remove Group (name)?”
3. Click [REMOVE NOW].

Show Protected Groups

There is a class of groups identified as protected groups. The privileges assigned to these groups can only be modified by a GE Service Engineer.

Select the **Show Protected Groups** checkbox to see these groups. Protected groups and privileges are shown with a violet (light purple) background.

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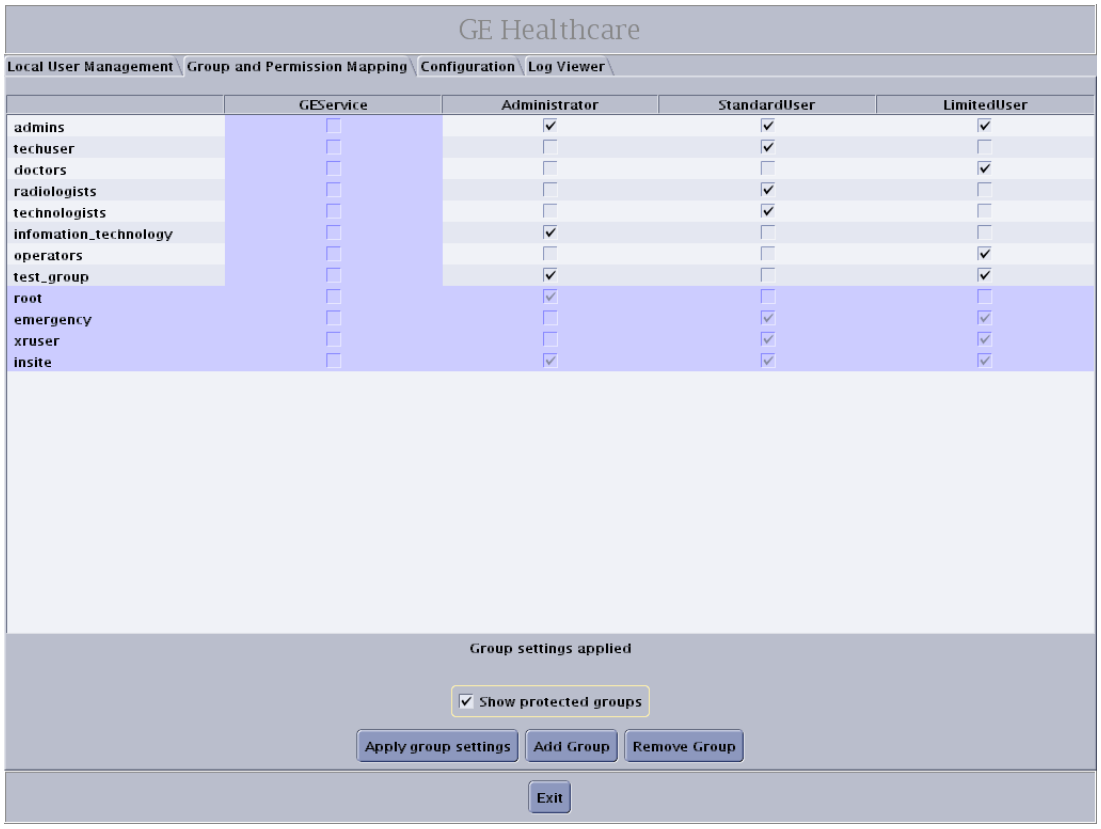
Figure B-4 Protected groups



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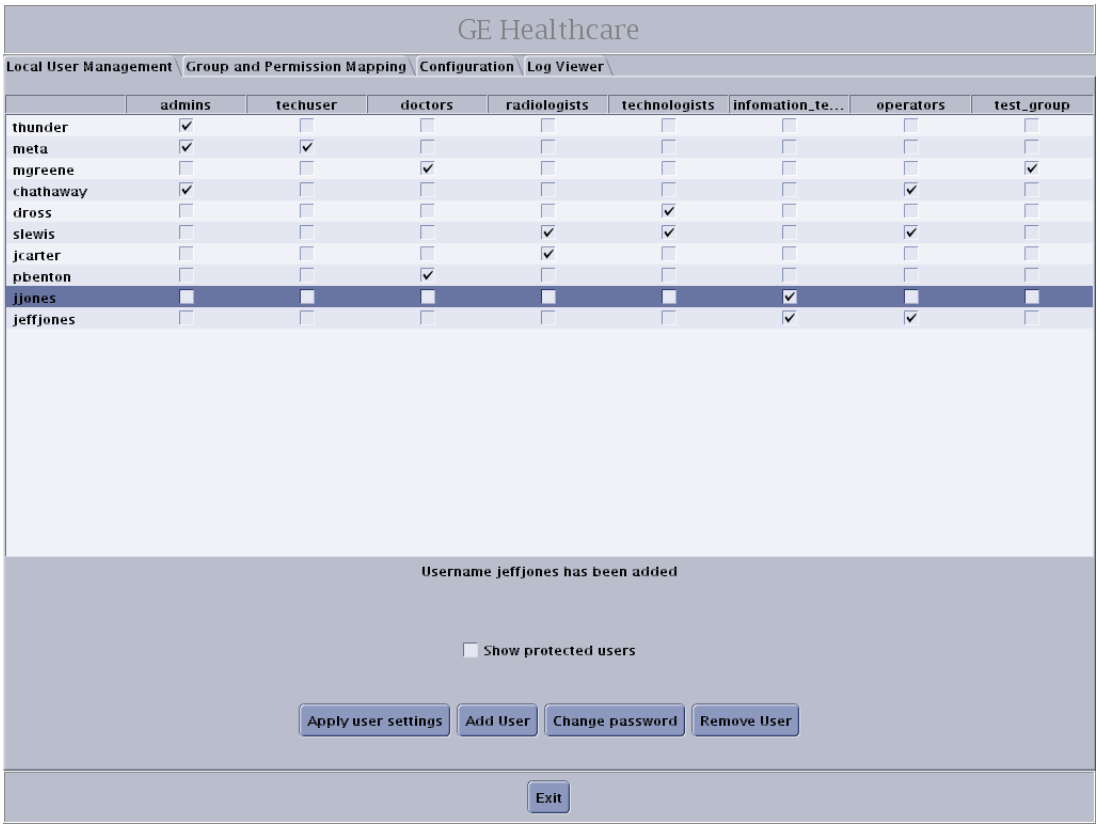
Working with Users

The Local User Management tab (Figure B-5) allows you to add users, assign users to groups, change user passwords, and remove users. On this screen, the available groups are at the top of the screen (columns) and the user names are on the left edge of the screen (rows).

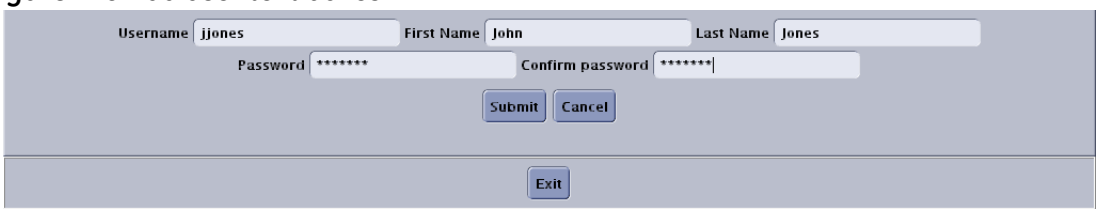
Figure B-5 Local User Management tab



Add Users

1. Select the **Local User Management** tab, if necessary.
2. Click [ADD USER].
   - Five text boxes appear near the bottom of the screen (Figure B-6).

Figure B-6 Add user text boxes



3. Type a Username.

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NOTE: Remember the following when creating user names:

- You cannot use the names “operator”, “admin”, or “administrator.” These names are reserved for use by the system and GE Service personnel.
- User names cannot have spaces or uppercase (capital) letters. Use all lowercase letters in the username and use underscores to separate words.
- User names cannot have special characters: ~!@#%^&*()+=[]{}\|:;’”,.<>/?
- The User name must be unique. That is, the system will not allow two people to have the same user name.

4. Type the user’s First Name.
   - This text box may be left blank but it is recommended that you type a name.

NOTE: Capital letters, spaces, and punctuation are allowed in the First Name and Last Name text boxes.

5. Type the user’s Last Name.
   - This text box may be left blank but it is recommended that you type a name.
6. Type a Password.

NOTE: The default system does not have pre-configured standards for password format or construction; however, your facility may have password standards that must be followed. Ask your facility’s System Administrator about password standards and create passwords that conform to those standards.

7. Re-type the password in the Confirm Password text box.

NOTE: The passwords must match exactly to be accepted.

8. Click [SUBMIT].
   - The new user is added to the table.
   - If the Username cannot be used or if the passwords do not match, you will receive a message that informs you of the problem. Type the correct information and click [SUBMIT] again.

Assign Users to Groups

1. Select the checkbox under the group heading to add the user to that group.
2. Click on a selected checkbox to remove the user from the group.

NOTE: You may select or deselect groups for multiple users.

NOTE: You cannot change the group assignments for protected users.

3. Click [APPLY USER SETTINGS].

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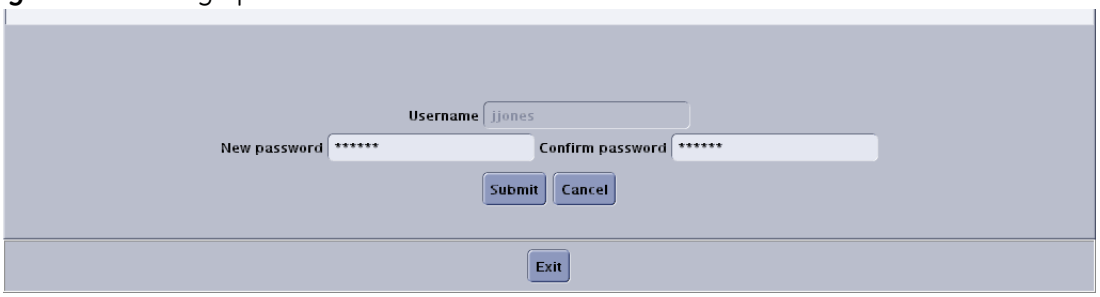
Change User Password

You cannot see user's passwords for security reasons. In the event of a forgotten password, you may change the password and then tell the user the new password.

1. Click a user name to select it.
2. Click [CHANGE PASSWORD].
   - The Password and Change Password text boxes appear.

Figure B-7 Change password



3. Type a password into the New Password field.

NOTE: The default system does not have pre-configured standards for password format or construction; however, your facility may have password standards that must be followed. Ask your facility's System Administrator about password standards and create passwords that conform to those standards.

4. Re-type the password into the Confirm Password field.
5. Click [SUBMIT].

Remove Users

1. Click a user name to select it.

NOTE: You cannot delete protected users.

2. Click [REMOVE GROUP].
   - A message appears: "Remove User (name)?"
3. Click [REMOVE NOW].

Show Protected Users

There is a class of users identified as protected users. The privileges assigned to these users can only be modified by a GE Service Engineer.

Select the **Show Protected Users** checkbox to see these users. Protected users and groups are shown with a violet (light purple) background.

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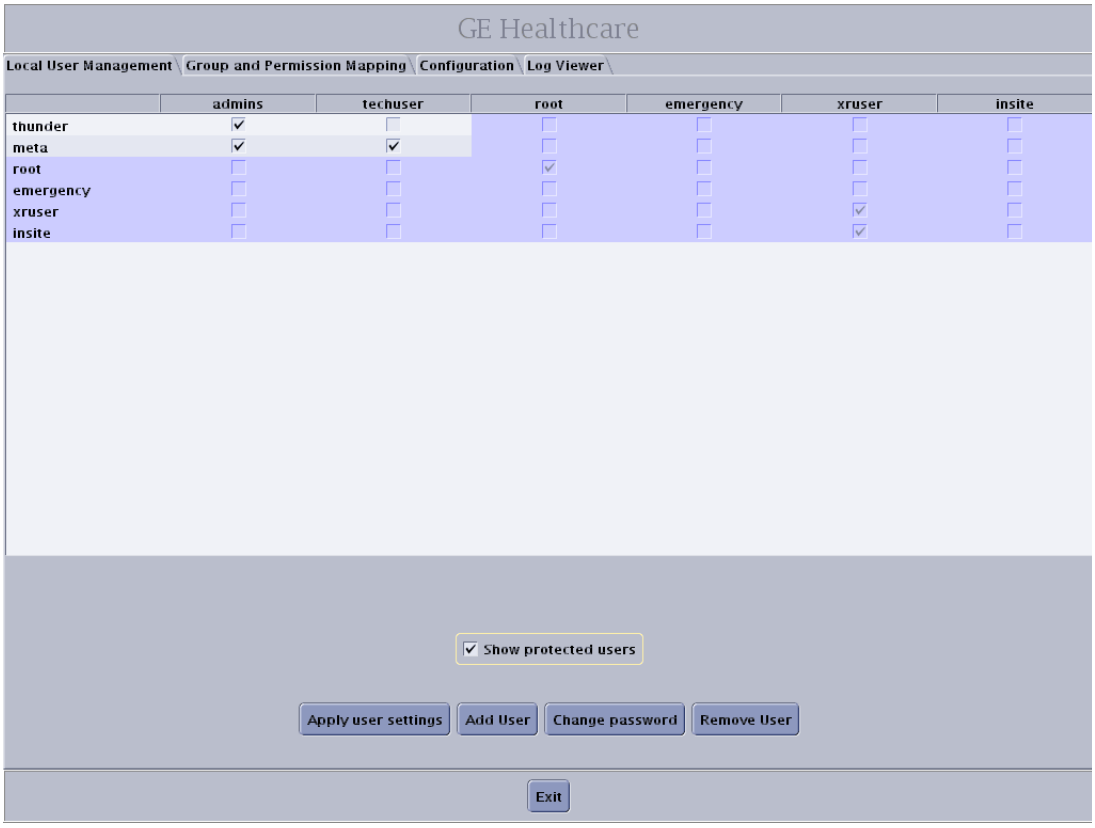
Figure B-8 Protected users



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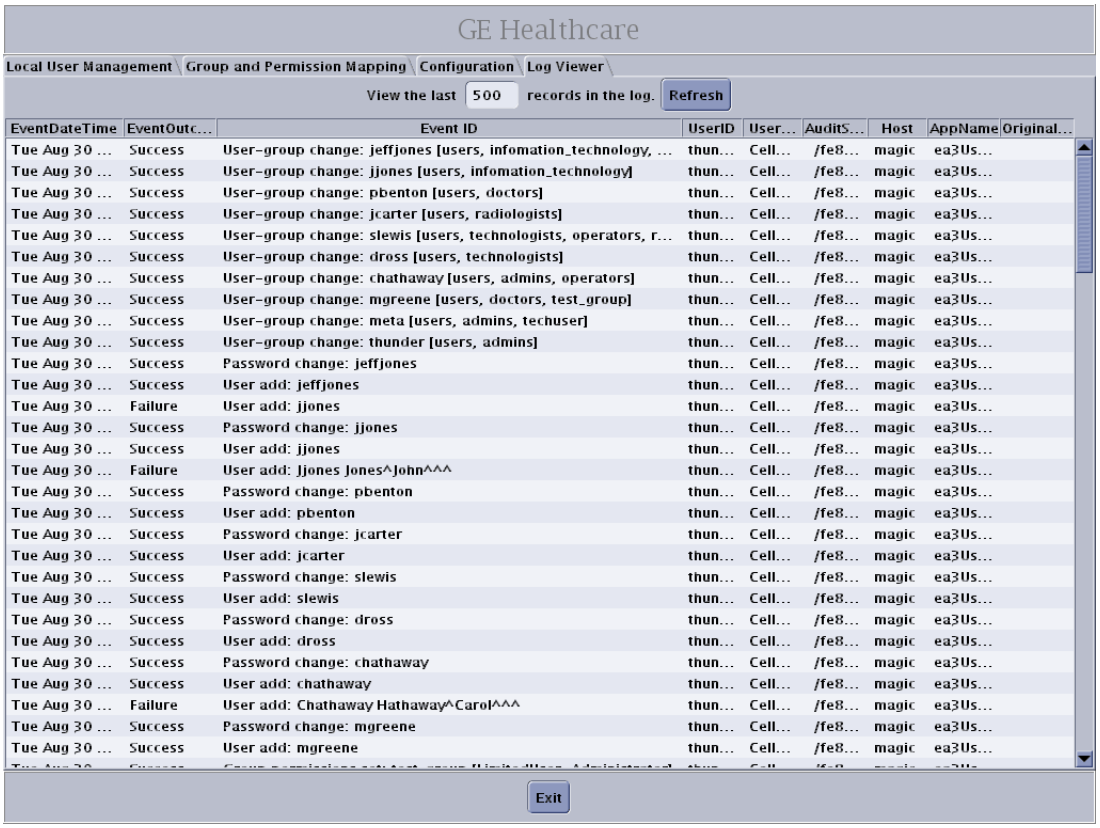
Viewing the Audit Log

The audit log provides information about who has accessed the system, when the system has been accessed, and the type of login (that is, emergency logins). The log settings are configured through the Configuration-Audit Log tab. Refer to *Configure Audit Log* (p. B-16) for more information.

Figure B-9 Log Viewer tab


GE Healthcare
Local User Management
Group and Permission Mapping
Configuration
Log Viewer
View the last 500 records in the log.
Refresh
EventDateTime
EventOutc...
Event ID
UserID
User...
AuditS...
Host
AppName
Original...
Tue Aug 30 ... Success User-group change: jeffjones [users, infomation_technology, ... thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: jjones [users, infomation_technology] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: pbenton [users, doctors] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: jcarter [users, radiologists] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: slewis [users, technologists, operators, r... thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: dross [users, technologists] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: chathaway [users, admins, operators] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: mgreene [users, doctors, test_group] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: meta [users, admins, techuser] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User-group change: thunder [users, admins] thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: jeffjones thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: jeffjones thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Failure User add: jjones thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: jjones thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: jjones thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Failure User add: jjones Jones^John^^^ thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: pbenton thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: pbenton thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: jcarter thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: jcarter thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: slewis thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: slewis thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: dross thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: dross thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: chathaway thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: chathaway thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Failure User add: Chathaway Hathaway^Carol^^^ thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success Password change: mgreene thun... Cell... /fe8... magic ea3Us...
Tue Aug 30 ... Success User add: mgreene thun... Cell... /fe8... magic ea3Us...
Exit

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Administering System Configuration

The Configuration tab (Figure B-10) allows you to perform several tasks that effect how the login function works.

When the Configuration tab is selected, another row of tabs appears. The following sections describe the controls available for each tab.

Change Display Settings and Enable Enterprise Authorization

The Configuration-Configuration tab (Figure B-10) allows you to set the inactivity timeout period, control whether the Emergency Login button appears, and to enable enterprise authorization.

Table B-1 describes each function.

Figure B-10 Configuration-Configuration tab

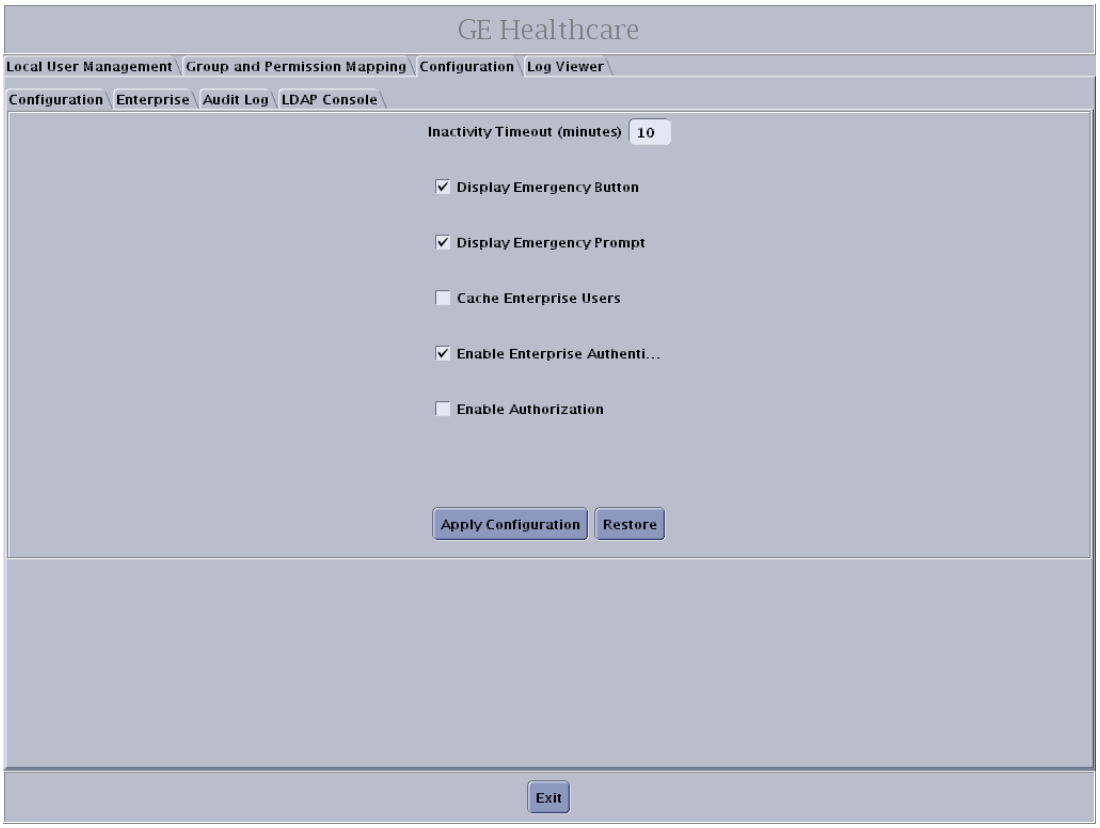

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Table B-1 Configuration function descriptions

Function	Description
Inactivity timeout	Sets the number of minutes before automatic logout will occur. For example, if you enter 10 minutes, the system will display the splash screen after 10 minutes of inactivity (no keyboard entry or mouse movements), requiring the user to log in. When logging back in, the system is returned to its last know state. To disable inactivity timeout, enter “0”.
Display Emergency Button	Allows the Emergency Login button to be shown on the Login screen. If this button is not displayed, only those users with a valid account can log onto the system.
Display Emergency Prompt	When the [EMERGENCY LOGIN] button is clicked, displays a prompt that requires emergency users enter their names.
Cache Enterprise Users	Allows all users previously set up on the system to log in even if the site network is down.
Enable Enterprise Authentication	Verifies users and what privileges they have based on the network settings at your site.
Enable Authorization	For facilities with enterprise login, enables checking group membership before allowing users to enter the system. With authorization, you must add user groups to the group tab in order to let people log in.
[APPLY CONFIGURATION]	Applies the settings.
[RESTORE]	Restores the setting to the last applied configuration. That is, when the [APPLY CONFIGURATION] button was last clicked.

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Configure Enterprise Authorization

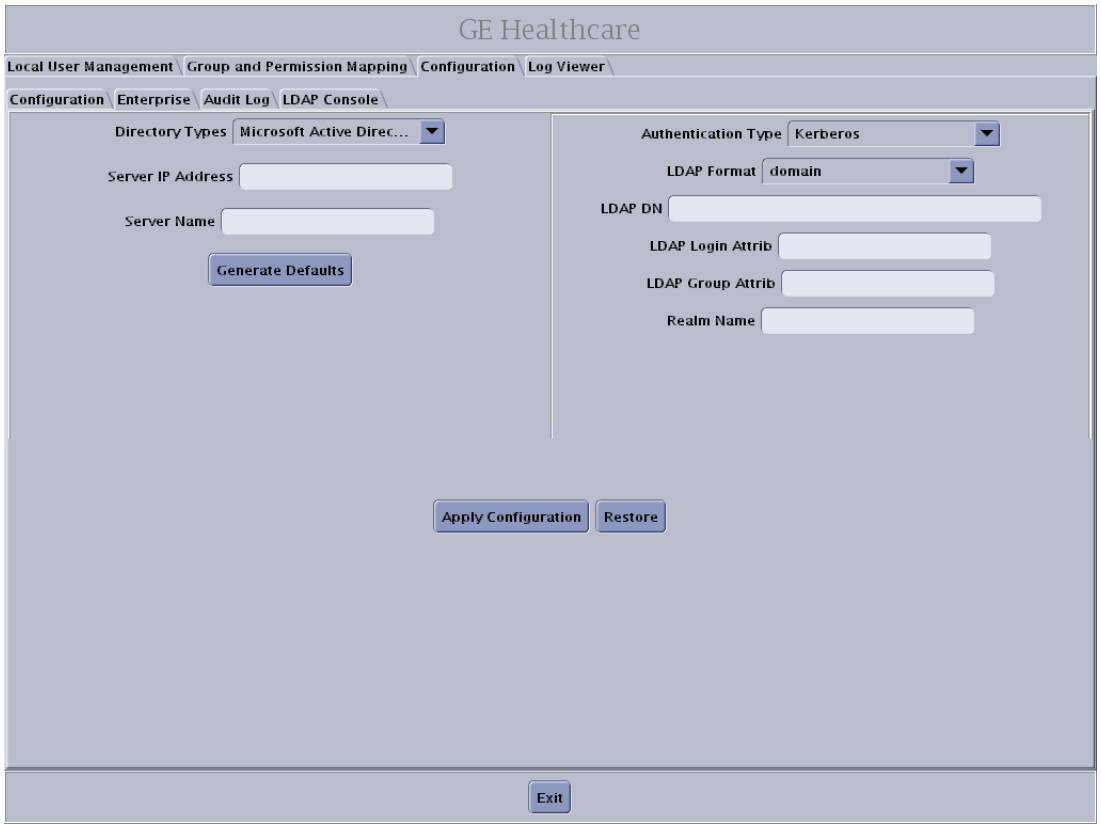
The Configure-Enterprise Tab is used by the site's IT (Information Technology) or GE Service personnel. It provides connectivity to the site's user database. If you do not have a network established in your facility, this tab will not be used.

When the fields on the left side of the screen are completed, press [GENERATE DEFAULTS] to auto-populate the fields on the right side with suggested defaults. Modify the information as appropriate.

Click [APPLY CONFIGURATION] to apply the settings.

The [RESTORE] button resets the tab to the last saved settings.

Figure B-11 Configuration-Enterprise tab



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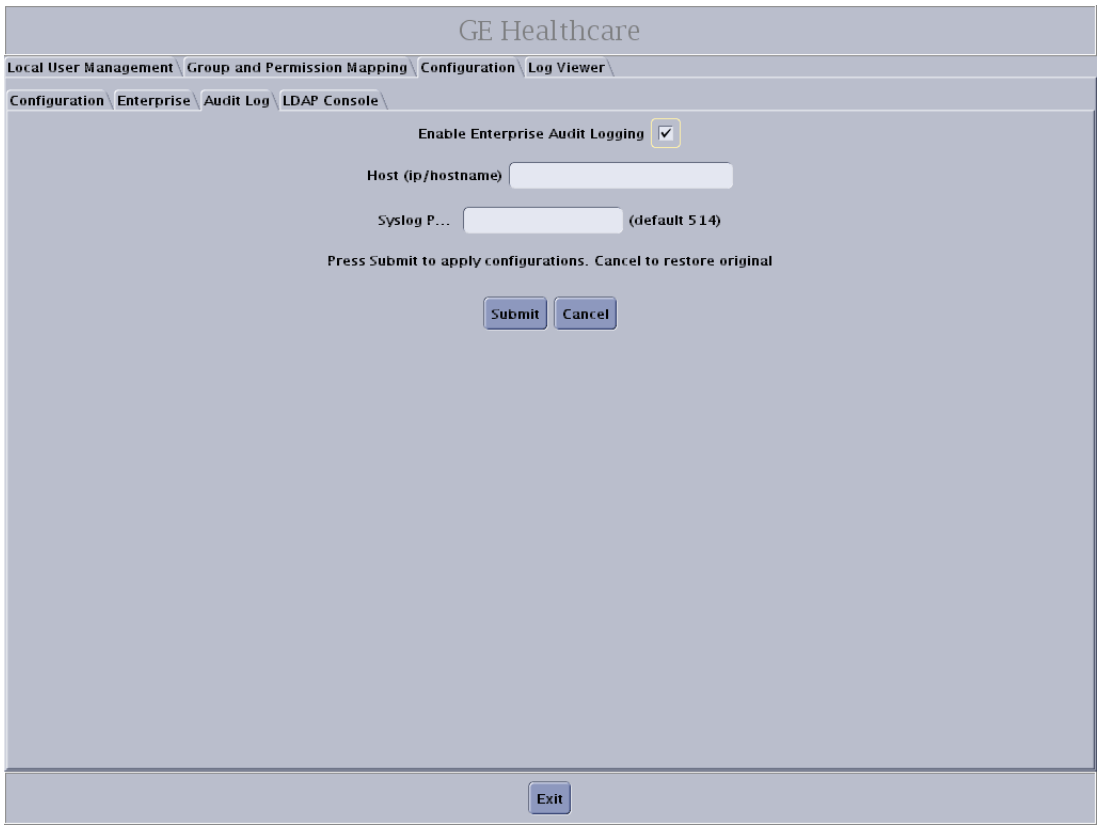
Configure Audit Log

If enterprise authorization is enabled, this tab controls if audit logging is to be enables, which hosts will be tracked, and the number of events to track.

Click [SUBMIT] to apply the settings.

Figure B-12 Configuration -Audit Log tab



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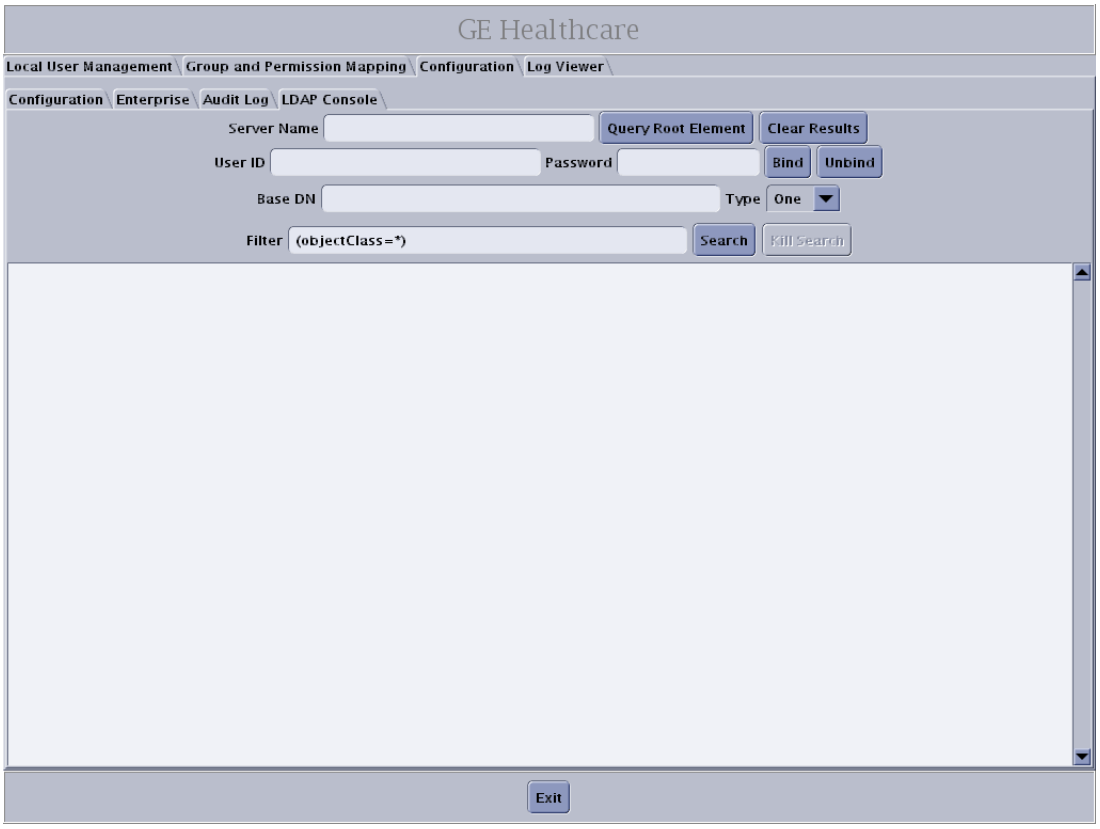
Use LDAP Console

Lightweight Directory Access Protocol (LDAP) functions are available from the Configuration-LDAP Console tab.

Figure B-13 Configuration-LDAP Console tab



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Appendix C
Digital Detector Overview

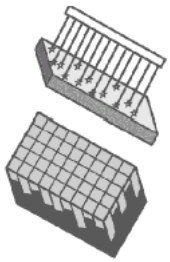
Theory Overview

The GE X-ray digital detector is based on amorphous silicon technology that converts x-rays into digital data, which then becomes a high quality image. The image can be viewed by physicians, stored electronically, or rapidly transmitted to consulting physicians anywhere in the world.

Detector Size

The large format detector measures 41x 41cm in area. A penny is shown in the lower right corner of this digital detector as a size reference.

Number of Pixels



Each detector provides 4 million pixels of data. Each pixel delivers up to 16 bits of data. This produces images comparable to fine-grain film.

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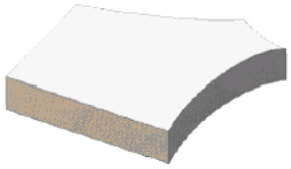
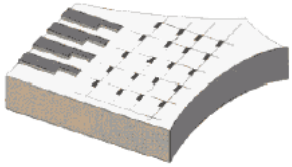
Glass-Panel Substrate



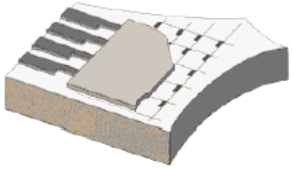
Manufacture of the flat-panel detector starts with a 41 cm x 41 cm glass panel substrate. This single piece of plexi-glass creates the base of the detector.

Amorphous Silicon Components



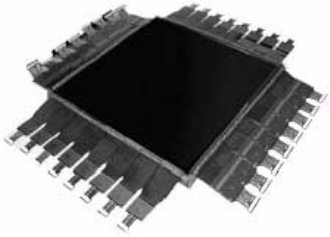
Successive thin-film layers of silicon, metals, and insulators are deposited on the glass substrate. These amorphous silicon materials form an array of photodiodes and thin-film transistor switches.

Scintillation Material



Since amorphous silicon cannot absorb x-rays directly, a scintillator material is deposited over the detector array. The scintillator material converts x-rays into visible light.

Connect to Electronics



The completed detector is connected to integrated circuit amplifiers and electronics. This produces the digital signal for the computer.

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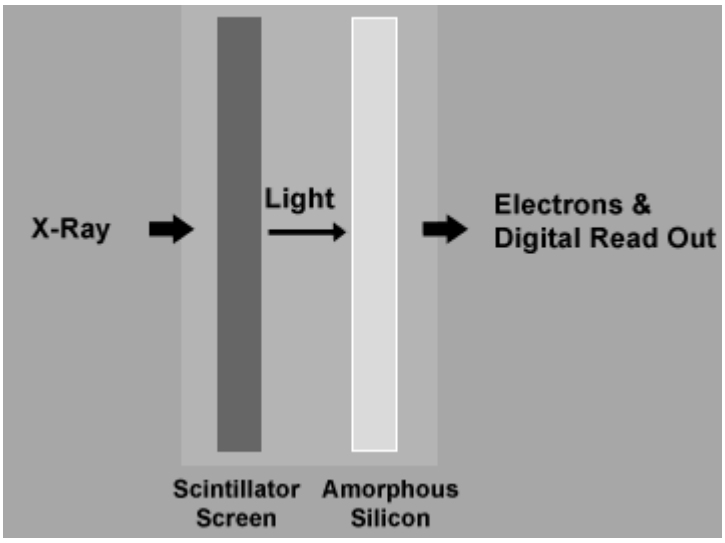
Detector in Wall Stand or Table

The last step is to place the detector into the vertical wall stand or table.

Digital Image Creation

The process of converting x-rays into a digital signal can be summarized as follows (Figure C-1). The x-rays strike the scintillator screen detector. The scintillator converts the x-rays into light, which is absorbed by the amorphous silicon photodiodes. These photodiodes convert the light into electrons. The electrons are collected to an array of electronic switches and signal lines. The digital signals are then passed on to a computer, and appear as an x-ray image on the monitor.

Figure C-1 Digital Image Creation process



Large Panel Size

There are many benefits to using the GE x-ray digital detector (Figure C-2). The large panel size is large enough to scan x-ray images without any special manipulation. Other digital x-ray imaging systems exist, but they achieve their large format capabilities differently. Most of these other systems are called charged couple devices (CCDs). They can only be manufactured up to a few inches on a side. To capture a complete chest x-ray image, they must either be tiled together to the appropriate size, or an optical system must be placed between a fluoroscope screen and the small-scale detector. Both of these alternatives produce light losses and distortion into the final images.

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Figure C-2 Digital X-ray Detector

Wide Dynamic Range

Digital x-rays have a wider dynamic range than conventional film. This means there are a greater number of steps between the lightest and darkest regions on the image. This means radiologists may be able to determine finer density variations, and improve their final diagnoses.

Fewer Retakes

Since there is a greater amount of diagnostic information accessible in a single digital image than in multiple film-based x-ray images, fewer images need to be taken. The number of retakes is also reduced by the ability to re-process individual acquisitions multiple times without re-exposing the patient. This can result in a lower patient dose.

No Darkroom Needed

Digitally acquired images are instantly available without any film processing delays. Also, using digital x-rays frees a department from other impediments of film. There is no darkroom, no chemicals, no special plumbing, and no hazardous waste to track or dispose of. Softcopy reading can also reduce staffing, as there is no film management such as storage and retrieval.

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Electronic Storage

Digital x-ray images can be stored in a fraction of the space currently used for film. Electronic storage also saves the labor cost needed to archive and retrieve x-ray films. It also relies on interfacing with radiology and hospital information systems, so that x-rays can be collated electronically, with patient histories and other test results.

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Appendix D
Specifications List

- Tube
  - X-ray tube heat capacity: 350 Khu
  - Total heat capacity of tube: 1500 Khu
  - Focal point of X-ray tube: 0.6 mm (small) and 1.25 mm (large)
  - Anode heat cooling rate: 75 Khu/min
  - Cooling rate of tube housing: 60 Khu/min
  - Weight: 29.5 kg
  - Maximum voltage to ground, anode or cathode: 82 kVp
  - Maximum voltage, anode to cathode, rectified: 150 kVp
- Ambient operating conditions
  - Ambient temperature: 15°~35°
  - Relative humidity: 10~80% (maximum change 30% per hour)
  - Atmospheric pressure: 70.1~106 kPa
- Power supply conditions
  - Voltage: Three-phase; AC; 380, 400, 420, 440, 460, 480V±10%
  - Frequency: 50/60Hz ±1Hz
  - Power impedance: <0.9 Ω
- High-voltage generator - rated power
  - Nominal rated power: 65kW and 80kW
  - Max. Output:
    80kW (Max. tube current 1000mA@80kV);
    65 kW (500mA@130kV)
  - Rating Output:
    80kW (800mA@100kV, 0.1s);
    65kW (630mA@100kV, 0.1s)
- High-voltage generator - tube voltage range
  - 40~150kV, minimum increment: 1kV
  - Allowable deviation: < ±3% ± 2 kVp

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- High-voltage generator - Tube current range
  - X-ray tube current range: 10~1000 mA (80kW), 10~800 mA (65kW)
  - Allowable deviation: ≤ 20%
- High-voltage generator - Accuracy of exposure amount (mAs)
  - Allowable deviation: <±(10% + 0.2 mAs)
- High-voltage generator - Time of exposure
  - 2-2000 ms
  - Allowable deviation: ≤ ±(10% + 1 ms)
- Collimator
  - Automatic and manual X-ray beam collimation
  - Operator selectable added filters: 0.1mm, 0.2mm or 0.3mm copper
- Tilting wall stand system
  - Size of Wall stand detector housing: 65cm X 55cm (width x Height)
  - Vertical travel of detector: 1500 mm ± 10mm
  - Tilting range: +90° ~ -20°
- 4-directional floating table
  - Motorized elevating range: 520mm~820 mm
  - Size of tabletop: 880mm (W) X 2290 mm (L)
- Digital acquisition, processing & review workstation
  - System controller PC directs and coordinates all system operations
  - 1280×1024 display (dual displays, 19" monitor)
  - Storage: > 3600 images
  - Preview image: < 3s.
  - Expose to expose time: < 5s (under condition of tube heat units remaining above 70%)
  - Dual energy all images: < 16s

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